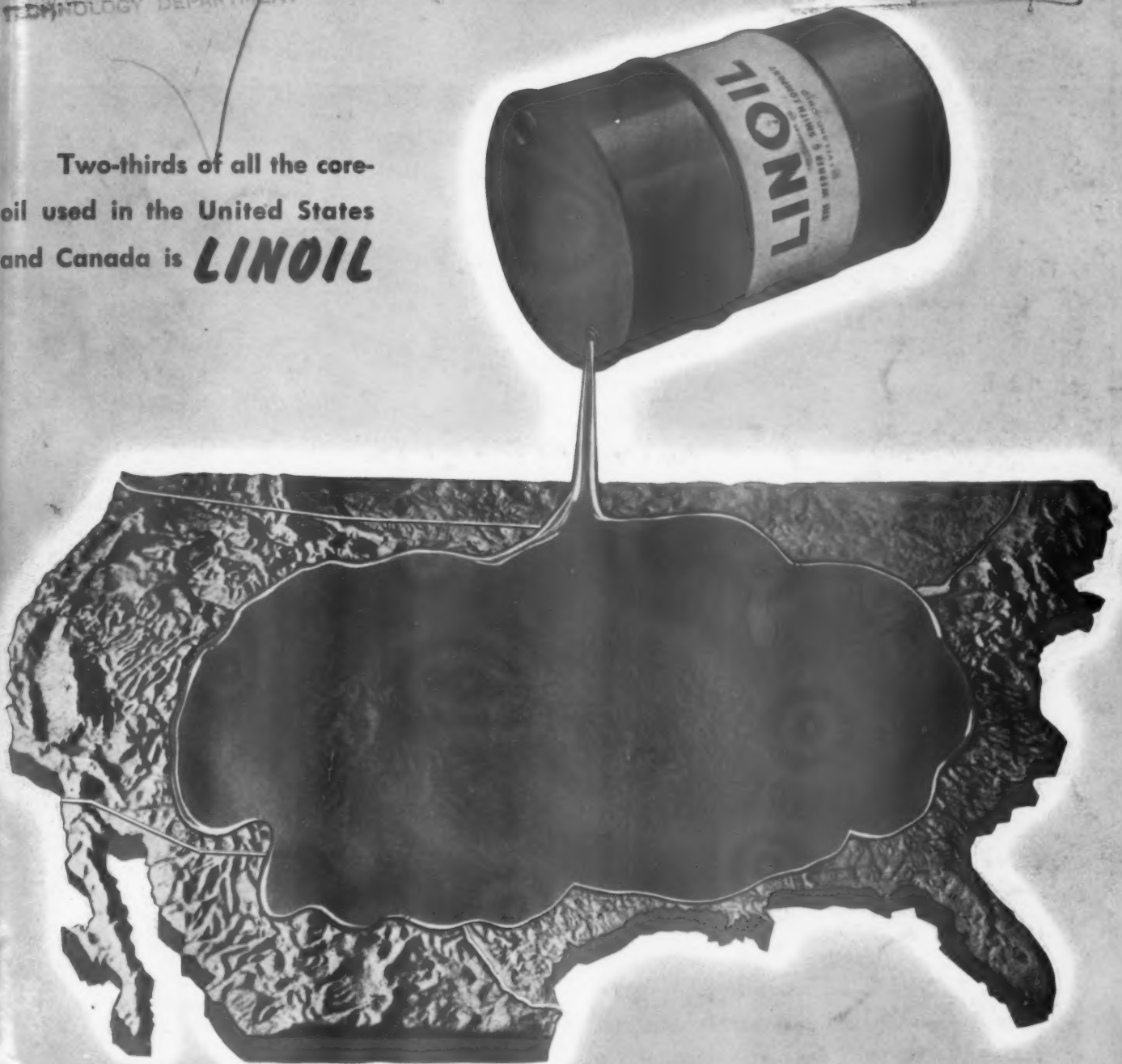
July, 1949

THE FOUNDRY

wherever metals are cast...

TECHNOLOGY DEPARTMENT

Two-thirds of all the core-oil used in the United States and Canada is **LINOIL**



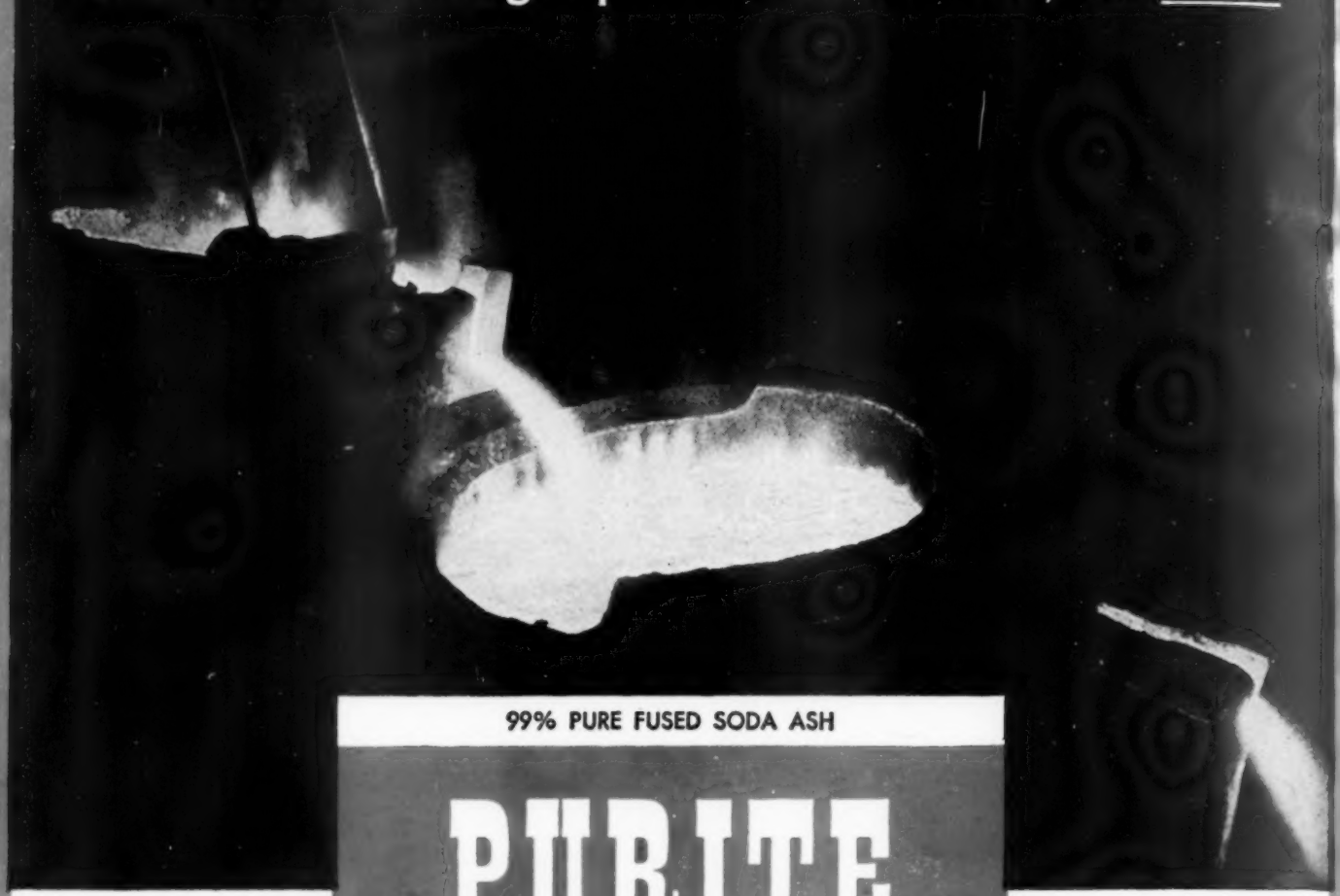
THE LINOIL THE LOGICAL OIL

WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 WEST 110th STREET · CLEVELAND 2, OHIO

For a Smooth-Running Cupola and Uniform Iron, Use Purite



99% PURE FUSED SODA ASH

PURITE

The Scientific Flux for Better Melting and Cleaner Iron

A smooth-operating cupola, from the start to the finish of the heat, is the first essential in maintaining uniform iron in the mass production of specification castings.

Purite—in the cupola hearth or in the ladle—helps smooth out variations in the molten metal. By accelerating combustion reactions, Purite restricts the combustion zone to a smaller, hotter area over the tuyeres; it prevents bridging and reduces oxidation of the metal charge. Purite makes a refining slag which purges the molten iron of sulfur, oxides and silicates and thus helps to improve machinability and to reduce shrinkage and segregation defects.

Purite has been used for over 25 years in helping to make sounder and better castings. Can you afford to overlook this inexpensive means of improving your castings?

Our advice is always available—to help you improve your cupola practice and make better castings with Purite.

MATHIESON CHEMICAL CORPORATION
60 EAST 42nd STREET, NEW YORK 17, N. Y.
In Canada: Railway & Power Engineering Corporation, Limited

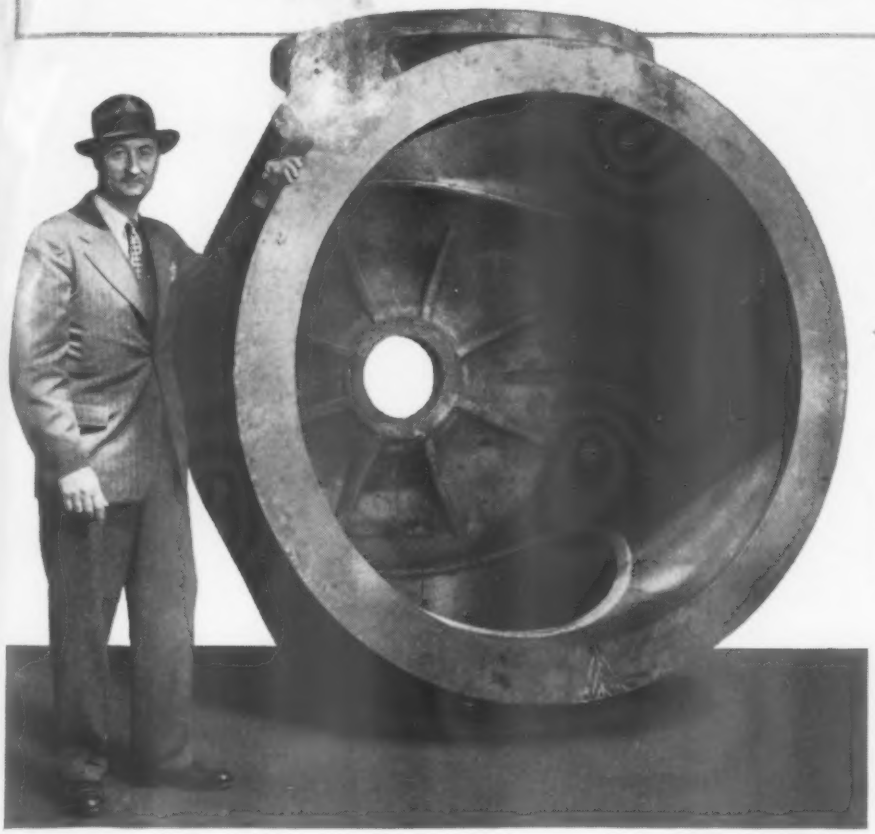
Mathieson
CHEMICALS

Purite (Fused Soda Ash) . . . Chlorine Dioxide . . . Caustic Soda . . . Soda Ash . . . Bicarbonate of Soda . . . Ammonia, Anhydrous & Aqua . . . Sodium Chlorite Products . . . Liquid Chlorine . . . HTH Products . . . Dry Ice . . . Carbonic Gas . . . Sodium Methylate

TECHNOLOGY DEPARTMENT

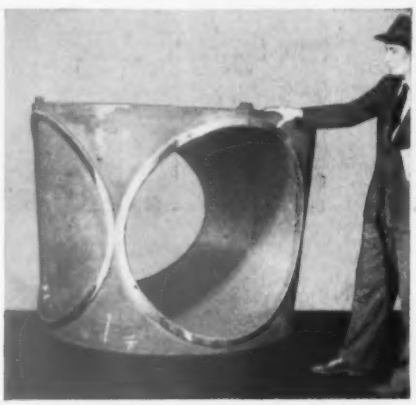
Chapman Valves meet ASTM "Class 50" specifications *with Nickel Alloy Cast Iron*

PUBLIC LIBRARY
JUN 30 1949



50,000 PSI MINIMUM TENSILE STRENGTH DEVELOPED IN VALVE CASTINGS WEIGHING UP TO FIFTEEN TONS EACH

Containing 2.00 per cent nickel, 0.25 per cent molybdenum and 0.75 per cent chromium . . . these vital units cast by The Chapman Valve Manufacturing Company of Indian Orchard, Mass., comprise key parts of the equipment being supplied for the Delaware Aqueduct by S. Morgan Smith Company, York, Pa.



This cone for the 42" Chapman nickel iron valve body, pictured above, shows the Monel facing applied over a Ni-Rod base to provide maximum resistance to erosion and corrosion.

THE flow of a great underground river of Catskill mountain water for New York City will be controlled in subsurface valve chambers by these Chapman cone valves made of nickel alloy cast iron.

The nickel alloy iron adopted for these castings meets A.S.T.M. "Class 50" specifications, and provides sound, dense, high-strength units. Aqueduct valves, however, operate partially closed for long periods, and the resultant turbulence attacks surface metal of both seats and rings. To defeat this corrosive and erosive action, the Board of Water Supply specifies that these parts be faced with Monel*. The valve manufacturer applies Monel over a base layer of Ni-Rod*, the nickel electrode specially developed for cast iron welding.

Readily developing 50,000 p.s.i. tensile strength minimum, these valves exemplify how the right nickel cast iron not only helps foundrymen meet high mechanical property specifications, but the metal also assures trouble-free performance for the ultimate user.

Write for our recommendations regarding the best nickel alloyed iron for your applications.

*Reg. U. S. Pat. Off.

EMBLEM OF INCO SERVICE

Over the years, International Nickel has accumulated a fund of useful information on the properties, treatment, fabrication and performance of engineering alloy steels, stainless steels, cast irons, brasses, bronzes, nickel silver, cupro-nickel and other alloys containing nickel. This information is yours for the asking. Write for "List A" of available publications.

THE INTERNATIONAL NICKEL COMPANY, INC.

67 WALL STREET
NEW YORK 5, N. Y.

IN CASTINGS OR IN SYMPHONIES,
PERFECTION IS ATTAINED THROUGH

control

GREEN BOND

If the strength and volume of a philharmonic orchestra were not controlled, the result would be chaos, or general pandemonium. If the strength of a molding sand were not controlled, there would be very little casting at a profit. FEDERAL GREEN BOND, processed from the finest Western Bentonite, is a definitely superior bond. It can be mixed to produce a firm, unyielding sand, or a sand that collapses readily and flows freely. There is no variation in the quality or uniformity of GREEN BOND—a shovelful from one bag, or an entire carload show the same properties and characteristics. Foundrymen like GREEN BOND after the first trial—after that, they are friends for life.

THE BEST OF THE BENTONITES

THE FEDERAL FOUNDRY SUPPLY COMPANY

4600 East 71st Street • Cleveland 5, Ohio

Seacoal Plant — Mines

CROWN HILL, W. VA. • CHICAGO • CHATTANOOGA, TENN. • DETROIT • MILWAUKEE • NEW YORK • ST. LOUIS • RICHMOND, VA. • UPTON, WYO

The Foundry Supply Co., Inc., 404 So. Third St., Minneapolis 15, Minn. • Beaumont Cement Sales Co., Houston and Beaumont, Texas, and Harvey, La. • Grant and Company, Los Angeles, Calif. • Pacific Graphite Works, Oakland, Calif. • Van Waters & Rogers, Inc., Portland, Ore.

CANADA—Overseas Commodities Ltd., 2845 Grandview Hgy., Vancouver, B.C. • T.D. Barnes, 59 Sun Life Bldg., Hamilton, Ont. • Newman Foundry Supply, Ltd., 643 St. Paul St. W., Montreal, Que.

European Concessionaires: The District Chemical Company, Ltd., 1-19 New Oxford St., London W. C. 1, England

JULY, 1949

THE FOUNDRY

VOLUME 77—NUMBER 7

EDITORIAL STAFF

FRANK G. STEINEBACH
Editor

WILLIAM G. GUDE
Managing Editor

EDWIN BREMER
Metallurgical Editor

PAT DWYER
Engineering Editor

ROBERT H. HERRMANN
Associate Editor

DON S. CADOT
Art Editor

VIRGINIA C. TAYLOR
Assistant Editor

VIRGINIA B. HARMS
Assistant Editor

New York ..... B. K. PRICE, L. E. BROWNE
Chicago ..... E. F. ROSS, H. C. TUTTLE
Detroit ..... A. H. ALLEN
Pittsburgh ..... J. C. SULLIVAN
Washington ..... E. C. KREUTZBERG
London ..... VINCENT DELPORT

Advisory Staff

JOHN W. BOLTON
JOHN HOWE HALL
ALBERT E. GROVER
HARRY A. SCHWARTZ

BUSINESS STAFF

J. M. LATHROP
Advertising Manager

New York ..... J. F. AHRENS
Chicago ..... G. A. POPE, A. W. JOHANSEN
Cleveland ..... A. L. KLINGEMAN
Los Angeles ..... F. J. FULLER

Circulation and Research

J. W. ZUBER, *Director*
R. L. HARTFORD, *Market Research*
JAMES G. DOOLITTLE, *Subscriptions*

Production Department

A. V. ANDERSON, *Manager*
W. J. STAAB, *Assistant Manager*

Main Office

Penton Building, Cleveland 13, Ohio

Branch Offices

New York, 17 ..... 16 East 43rd St. Murray Hill 2-2581
Chicago, 11 ..... 520 N. Michigan Ave. Whitehall 4-1234
Detroit 2 ..... 6560 Cass Ave. Madison 3024
Los Angeles, 4 ..... 130 N. New Hampshire Ave. Fairfax 1758
Pittsburgh, 19 ..... 2806 Koppers Building Atlantic 3211
Washington, 4 ..... National Press Building Executive 6849
London ..... 2 Caxton St. Westminster, S.W. 1

THE FOUNDRY is published monthly by THE PENTON PUBLISHING CO., Penton Building, 1213 West Third Street, Cleveland, O. EARL L. SHANER, Chairman of the Board and Treasurer; GEORGE O. HAYS, President; RUSSELL C. JAENKE, Vice President; FRANK G. STEINEBACH, Vice President and Secretary, and EDITH L. WERNER, Assistant Treasurer.

Subscription: In the United States and possessions, Canada, Mexico, Cuba, Central and South America, one year $3; two years, $5. Other foreign countries, $6. Single copies 35 cents. Copies published three months or more previous to date of current issue, 50 cents.

Member: Audit Bureau of Circulations and National Publishers Association. Copyright 1949 by THE PENTON PUBLISHING CO.

Entered as second class matter at postoffice at Cleveland under act of March 3, 1879.

THE FOUNDRY is indexed regularly by Engineering Index Inc.

Editorial 67

Determination of Total Carbon in Irons 68
By ROY E. DEAS and LILLIAN T. CONRADI

Static Properties of Cast Steels 70
By HARRY A. SCHWARTZ

Use of Tellurium in Promoting Chills on Gray Iron 74
By C. R. AUSTIN

Machine Molding of Steel Castings 78
By JOHN HOWE HALL

Mechanized Units Installed By Textile Machine Works 82
By WILLIAM G. GUDE

Effect of Magnesium on Aluminum-Copper-Silicon Alloys 88
By R. A. QUADT and J. J. ADAMS

AFS Convention Technical Reports 91

Graphitization in the Malleable Iron Process (Part II) 92
By H. G. HALL

Man-to-Man on the Molder's Bench 114
By RALPH L. LEE

National Open Hearth Conference 180
By EDWIN BREMER

Around Detroit 192
By ARTHUR H. ALLEN

The Adventures of Bill 196
By PAT DWYER

Foundry Training of Engineering Graduates 206

Questions and Answers 96
Men of Industry 102
Foundry Statistics 116
Foundry Developments 118
Meeting Calendar 146
Foundry Data Sheet 147
Activities of Foundry Groups 152
Obituary 194
Industry Briefs 202
Equipment and Supplies 214
Helpful Literature 219
Trade Publications 242
Where-to-Buy Directory 261
Advertisers' Index 281

Setting cores in the drag half of the gear-case mold. 54 cores weighing a total of over 3000 pounds are used to make this 4700 pound casting.

CORES SAFEGUARD MACHINE TOOL CASTINGS

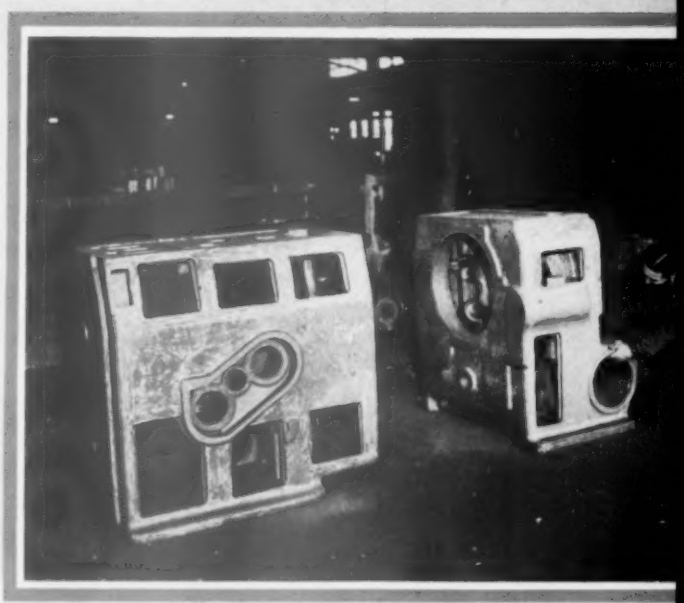
COMPANY • CLEVELAND, OHIO

It takes 54 core boxes to produce cores for this 4700 pound multiple-spindle machine gear case casting . . . and these 54 cores range in size from half-ton chunk cores down to small skim cores weighing only a fraction of a pound.

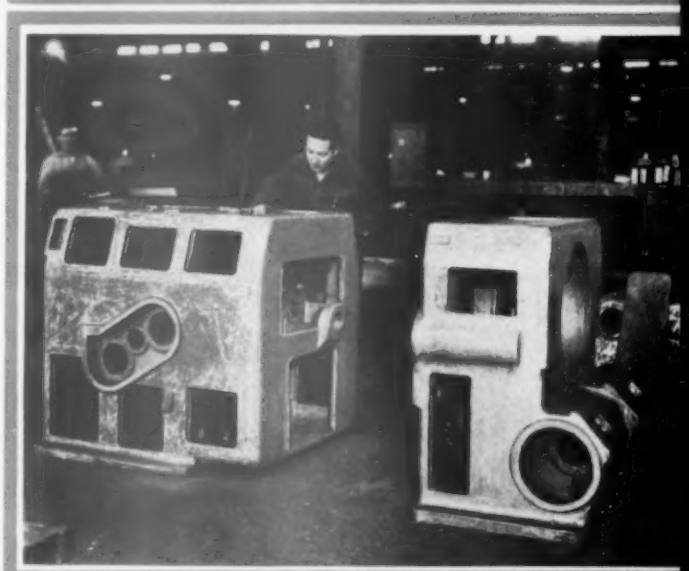
At Hill Acme, there are no "special" cores . . . all cores are treated pretty much alike, regardless of size or shape. Big and little cores are made from the same sand mix; baked side by side in the same ovens—eventually wind up side by side in the same mold.

With LINOIL in their sand mix, Hill Acme gets clean, sharp draws in their core room—no crumbling edges to be patched. LINOIL gives Hill Acme an even, all-the-way through bake in their ovens—no burned-out or plate-soft cores to be discarded. And in the mold, LINOIL cores insure smooth surfaces, accurate dimensions for high quality machine-tool castings.

You can safeguard the quality or quantity of your casting production with cores made with LINOIL, at no extra cost.



Gear-case and head-stock for a Gridley Automatic Multiple Spindle Bar Machine. Metal is a superior machine-tool quality iron—close grained, good machineability.



THE LINOIL — THE LOGICAL OIL

THE WERNER G. SMITH COMPANY

(DIVISION OF ARCHER-DANIELS-MIDLAND COMPANY)

2191 WEST 110th STREET • CLEVELAND 2, OHIO

User finds one ROTOBLAST barrel replaces five tumbling mills!

The 21-cubic-foot ROTOBLAST Barrel shown above, replaces five conventional tumbling mills at Oil Well Supply Company's Imperial Works, Oil City, Pennsylvania. Now entire normal foundry output is cleaned in five hours . . . a saving of 95.8% *on cleaning time alone!* Photo at left shows ROTOBLAST Barrel being loaded.

More than 25,000 Pangborn Machines Serving Industry

Pangborn

* Trademark of Pangborn Corporation

How does your cleaning time compare?

ROTOBLAST* Cleans Castings 24 TIMES FASTER!

for Oil Well Supply Co. of Dallas, Texas

Here is the proof!

In 1948 the Oil Well Supply Co. of Dallas, Texas, installed this 21 cubic foot Pangborn ROTOBLAST Barrel in its Oil City, Pa. plant. *The results are amazing!*

	Conventional Tumbling Mills	Pangborn ROTOBLAST
No. of Machines	5	1
Tons Cleaned	2	2
Cleaning Time	6-8 hours	*15-20 minutes*

REMARKS: *Pangborn ROTOBLAST cleans castings 24 times faster, a total saving of 95.8% on cleaning time alone!*

A year's operation showed additional savings . . . *fewer hours expended* because ROTOBLAST cleans entire normal foundry output of small and medium castings in *five hours* . . . castings with hard-to-reach pockets are completely cleaned . . . *machining is easier* and cheaper because ROTOBLAST removes all sand and scale . . . *abrasive costs are lower* because abrasive recovery unit reclaims all usable shot!

Find out about your plant!

No matter what kind of castings you turn out, whether you operate a specialty or jobbing foundry, there's a Pangborn ROTOBLAST *Table, Barrel,* or *Table-Room* designed to bring you amazing savings like this! Bulletin 214 gives all the facts . . . use the handy coupon to get your free copy. Address: PANGBORN CORPORATION, 1400 Pangborn Blvd., Hagerstown, Maryland.

FAMOUS Pangborn ROTOBLAST is designed to clean most effectively at *lowest cost per hour of operation*. It directs all the abrasive on a given target with highest velocity for a given peripheral speed . . . cleans faster, better, cheaper.

CLEANS FASTER because it throws a greater volume of abrasive, covers a larger area with greater density than possible with older methods.

CLEANS BETTER because it produces a finer finish than possible with old-style methods.

CLEANS CHEAPER because it requires less horsepower to propel abrasive with velocity and quantity equal to any other method . . . uses less manpower . . . minimizes maintenance . . . eliminates air compressor investments.

The right Pangborn Machine equipped with ROTOBLAST gives top blast cleaning efficiency. *Look to Pangborn for the latest developments in Blast Cleaning and Dust Control Equipment!*

Find out how you can cut blast cleaning costs to rock bottom in your plant with Pangborn ROTOBLAST. Send coupon for Bulletin 214.

PANGBORN CORPORATION
1400 Pangborn Blvd., Hagerstown, Md.

Please send me a free copy of Bulletin 214.

NAME ..... TITLE .....

COMPANY .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

BLAST CLEANS CHEAPER

with the right equipment for every job

It's "Ace High" at

CHAMPION JUNIOR CORE

IN PRODUCTION

Ever see anything easier to do? First, swing the blow-head to the left for an instant to fill with sand . . .

. . . Then to the right also with the left hand. Follow this with a twist of the right wrist . . . and whoosh! the boxes are clamped, horizontally and vertically and instantly filled.

Ace Foundry Company, producers of non-ferrous castings for the most exacting clientele, give enthusiastic reports on results achieved by their new CB-5 core blower.

SPEED—ACCURACY—UNIFORMITY EASY OPERATION

These are the outstanding characteristics of every Champion core blower, and Junior displays every one! Views at the left show the extreme simplicity of operation. *And speed—!* Just two simple motions of the hands and the boxes are uniformly rammed in a fraction of a second.

Typical Cores such as are being successfully blown on the Champion CB-5 Core Blower.

ACE FOUNDRY!

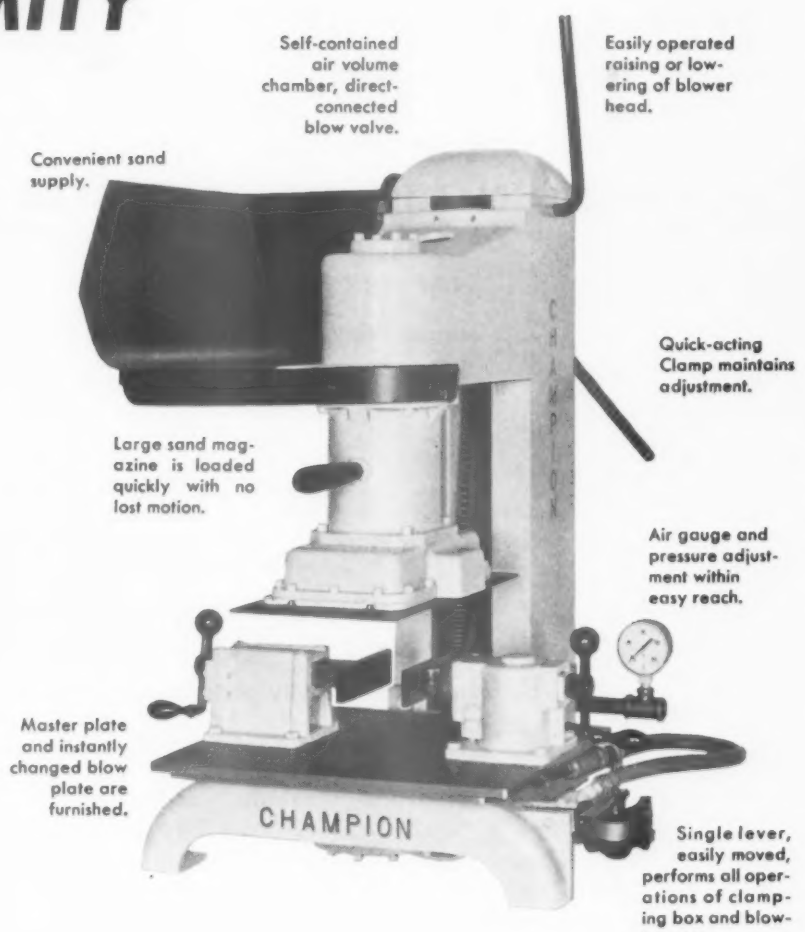
BLOWER CB-5 TAKES THE LEAD AND UNIFORMITY

EVERY JOB FOUNDRY CAN BLOW CORES AT A PROFIT!

Once upon a time a foundry might question the feasibility of core-blowing especially on short runs. Not so now! The savings in time, the uniformity of results made possible by the distinctive features of Champion Core Blower makes this method not only practical but well nigh imperative for the progressive foundry.

HERE'S AN OPPORTUNITY TO "CHAMPIONIZE" FOR HIGHER QUALITY AT LOWER COSTS

Just send us a metal core box for the core you wish to blow, with your order for a Champion CB-5 (The "Junior"). We will prepare the box for blowing, adjust the blower to the box, and ship the whole outfit back to you without delay. When the machine arrives, merely connect your air pressure, (85 lbs. is ample) fill the hopper with sand, and you're ready to go.


Self-contained air volume chamber, direct-connected blow valve.
Easily operated raising or lowering of blower head.
Convenient sand supply.
Quick-acting Clamp maintains adjustment.
Large sand magazine is loaded quickly with no lost motion.
Air gauge and pressure adjustment within easy reach.
Master plate and instantly changed blow plate are furnished.
CHAMPION
Single lever, easily moved, performs all operations of clamping box and blowing core.

A CHAMPION BLOWS BETTER CORES FASTER — EASIER — AT LOWER COST!

From the giant CB-400 down to the CB-5 ("Junior"), the same advanced engineering features, precision construction and smooth operation of any Champion Core Blower give instantaneous action, uniform quality, with effortless ease.

By eliminating lost motion, spoilage and waste, by producing uniformly high quality product, and by making man-power more productive, Champion Core blowers have won a firm place in the foundry picture.

Take advantage now of the new introductory offer, to see what the "Champion Method" will do for you.

CHAMPION FOUNDRY AND MACHINE COMPANY

SALES OFFICE: 1314 W. 21st STREET, CHICAGO 8, ILLINOIS

GENERAL OFFICE AND PLANT: ROCKFORD, ILLINOIS

MOLDING MACHINES CORE BLOWERS THE ELECTRIC RIDDLE

A/B Westin & Backlund
8 Liljeholmsvagen, Stockholm, Sweden

Bonvillain & Ronceray, Inc.
Rue Paul Carle, Choisy Le-Roi, France

W. F. Guth Industrial Equipment & Furnace Co.
Avenida R. S. Pena 852, Buenos Aires, Argentina

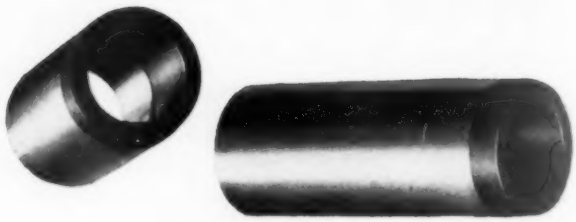
Mauricio Hochschild & Cia. Ltd.
Casilla 153 D, Santiago, Chile

Societa Torinese Adesivi Resine
Corso Moncalieri 414, Torina, Italy

HOLD THAT SAND!...

WITH AMAZING NEW SAND ARRESTER TUBE!

(Patent Applied For)



POSITIVELY ELIMINATES SAND STEMS ON BLOWN CORES!

1. Guaranteed for more than 100,000 blows.
2. Automatically delivers perfect cores.
3. Approved by the most experienced foundrymen.
4. Install without special tools.
5. Simple to install—push out the old—push in the new.
6. Special quality, wear resistant rubber—not affected by abrasion, oil, water or time.
7. Tough elastic rubber fused to seamless steel tubes by our own special process.
8. Steel tube heavily plated and rust proof.
9. Sand flows freely into core box.
10. Save cores, time and money.

We are prepared to make up for you enough tubes to fit any core box you choose. If at the end of thirty days you feel that the tubes are not worth what you paid, you may return them for full credit.

TUBES ARE PRICED AS FOLLOWS:

3/8" x 2"	$1.70
1/2" x 2"	1.90
5/8" x 2"	2.25
3/4" x 2"	2.35
1" x 2"	2.45

Add 10c for each additional inch or fraction of length.

THIRTY DAY TRAIL COUPON

Number needed ..... 3/8" O.D. by ... long
Number needed ..... 1/2" O.D. by ... long
Number needed ..... 5/8" O.D. by ... long
Number needed ..... 3/4" O.D. by ... long
Number needed ..... 1" O.D. by ... long

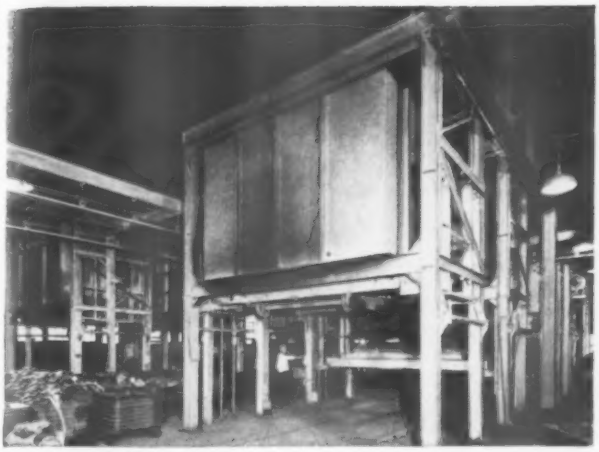
Tubes of any length or diameter can be made—we invite your inquiry.

FILL IN THE ORDER COUPON NOW! - - - INSTALL SAND ARRESTER TUBES WITHOUT DELAY!

MARTIN ENGINEERING COMPANY

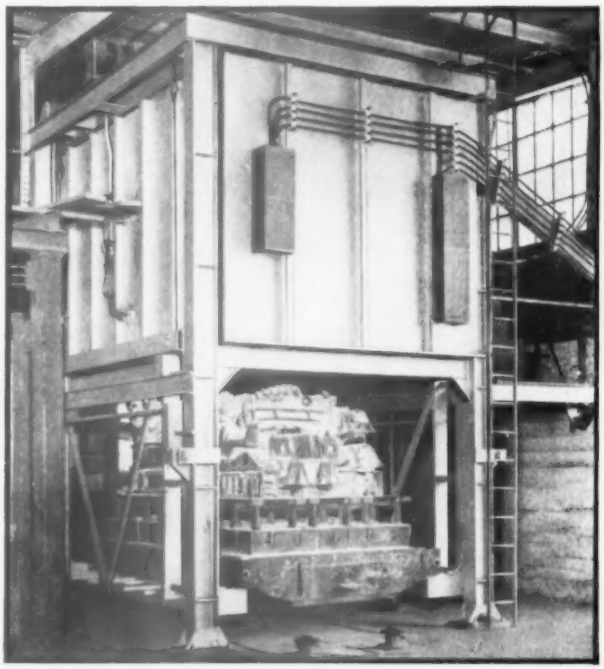
704 Rose St., Kewanee 2, Ill.

Annealing malleable iron castings



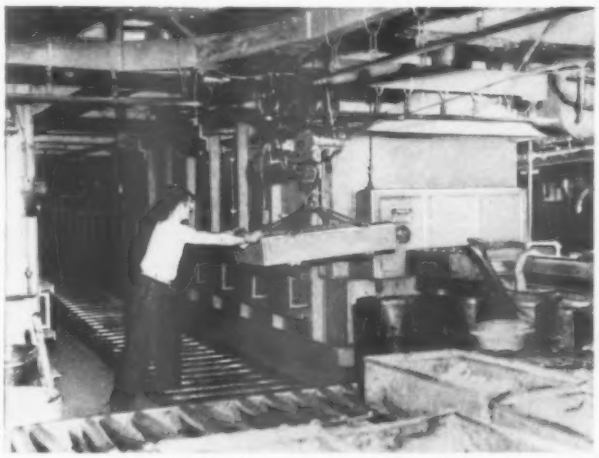
. . . four pairs of G-E electric furnaces anneal 100 tons per day in this midwestern foundry.

Annealing steel castings



. . . one G-E elevator furnace anneals 10 tons per charge in this southern foundry.

Annealing grey iron castings



. . . two pusher-type G-E furnaces anneal 30 tons per day in this eastern plant.

DO IT BETTER *Electrically*

Tell us about your annealing job, and we'll show you what General Electric furnaces can do for your particular operation. G-E furnaces and electronic induction heaters are also available in a variety of types and ratings for brazing, hardening, drawing, soldering, carburizing, and most other heat-treating processes. Ask your nearest G-E office to put you in touch with a G-E Industrial Heating Specialist. Or write direct to *Sect. 720-9, Apparatus Dept., General Electric Company, Schenectady 5, N. Y.*

ELECTRIC FURNACES

In addition to a shorter time cycle and increased output, they also give you:

- Lower over-all cost
- More uniform, better quality anneal
- Materially reduced cleaning costs
- Minimized thermal losses
- Cleaner, cooler working conditions
- Dependable continuity of service with less maintenance
- Less floor space required

GENERAL ELECTRIC

720-9

FOR FASTER PRODUCTION OF...

Better, Cleaner Castings

STEEL, MALLEABLE,
GREY IRON, NON-FERROUS USE...

DELTA CORE & MOLD WASHES

Three easy-to-understand reasons why more foundries use DELTA Core and Mold Washes . . .

1. MORE PERFECT CASTINGS . . , 2. LOWER CLEANING ROOM COSTS . . .
3. LESS SCRAP IN MACHINING.

HERE'S WHY...

a. Delta Core and Mold Washes "Anchor" themselves by penetrating from 3 to 5 grains deep into the sand. This bond between the wash and the sand . . . a distinctive DELTA characteristic . . . produces an expansion-resisting coating essential to the production of finer finished castings.

b. The hot strength of Delta Core and Mold Washes increases with each degree of temperature rise from 1800°F to 3000°F providing maximum critical hot strength for all foundry applications.
The higher hot strength of DELTA Core and Mold Washes eliminates surface sand fissuring, excessive sand expansion and distortion.

c. No gas leakage through Delta Core and Mold washed surfaces. Gases produced by decomposition of organic binders in the core sand cannot leak through Delta Core and Mold washed surfaces to contact the molten metal. Only Delta Core and Mold Washes provide this unique and all-important insurance against defective castings resulting from core gas leakage. DELTA Core and Mold Washes insure more perfect castings with finer finished surfaces.

DELTA CORE & MOLD WASH-BASE
Mix with silica flour and water to produce finished wash.

•

FOR STEEL
STEELKOAT — Special Core and Mold Wash.

•

FOR GREY IRON & MALLEABLE
Grakoat — Blackoat — Hi-temp.

•

FOR NON-FERROUS METALS
Non-FerrusKoat.

•

FOR ALL SAND CAST METALS
THERMOKOAT — It's Plasti-Lastic.
PYROKOAT-Hi-Speed.

•

FOR UNUSUALLY HIGH TEMPERATURE CONDITIONS
Z-KOAT-High-fusion-temp wash.

•

• *Ask for a liberal working sample.*

There is no "just as good" substitute for any DELTA Core and Mold Wash just as there is no substitute for DELTA'S scientific laboratory control of production which safeguards the quality and uniformity of all DELTA Foundry Products. DELTA Research laboratories developed, and pioneered the use of, Plastic-type Core and Mold Washes . . . and still leads the field in the development of new products for improved foundry practices.

DELTA OIL PRODUCTS CO.

MILWAUKEE 9, WISCONSIN

Pouring Flasks Stacked 10 High

A common sprue through the stack, feeds the molten metal to runners leading to individual casting cavities. Combines cope and drag in one flask section. Ideal for long runs of small or shallow castings.

Triples Your Foundry Production

Yes — stack molding can *triple* the casting output of your foundry — but only if you use rugged steel flasks designed and built to withstand severe strains and stresses. In stack molding, the molds are made in flask sections stacked one above another, to a height of 10 or 12 sections. The increased amount of hot metal in relation to the total flask volume generates tremendous heat with a corresponding increase in gas pressure. That's why steel flasks are "a must."

You'll find Sterling Steel Flasks are tailor-made for withstanding such terrific pressures. Sterlings are constructed of special rolled steel with a reinforcing rib around the side to prevent distortion and misalignment of the stacked molds. They are engineered to rigid specifications and have been successfully job-tested in high production foundries over a period of years. Write for the new Sterling Catalog No. 59.

STERLING WHEELBARROW CO.
MILWAUKEE 14, WISCONSIN, U. S. A.

A 5527-1P-C

I COULDN'T BELIEVE MY EYES WHEN TEST* SHOWED

Malleabrasive CUT BLAST CLEANING COSTS 58.9%

*. . . made at Ohio Forge & Machine Corporation.

The results of Ohio Forge & Machine Corporation's seven week Malleabrasive test were terrific . . . *43.5%* saved on cost of abrasive alone!

The test was run on forgings, and the next big saving to show up was *81.3%* less cost for replacement parts!

Less down time, less labor handling abrasive and replacement parts increased production 12.8% . . . *total savings*† add up to *58.9%* . . . big money no matter how you look at it!

Send for this Positive Proof!

Malleabrasive differs from every other shot and grit on the market today. It's more than "heat treated" or "annealed" . . . ***Malleabrasive is guaranteed*** to out-perform ordinary shot and grit when comparative tests are properly run!

See for yourself how Malleabrasive has cut cleaning costs up to 50% and more for other foundries! Recent tests of Malleabrasive give complete savings. Write for your copy today to: THE GLOBE STEEL ABRASIVE CO., Mansfield, Ohio.

Packed in new black and orange striped 100-pound bags.

† *Send for test results which show total savings*

PATENTED‡

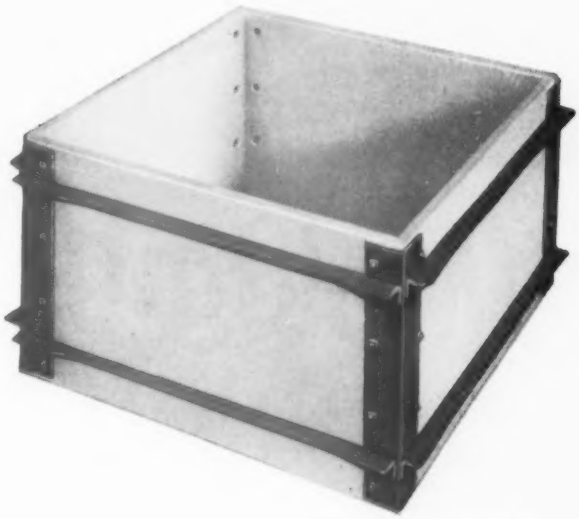
Malleabrasive®

‡ U.S. Patent #2184926 (other patents pending.)

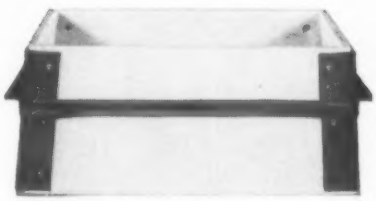
THE GLOBE STEEL ABRASIVE CO., MANSFIELD, OHIO

. MANUFACTURERS OF METAL ABRASIVES SINCE 1907 .

Are You Tired of Jackets that STICK?



CHANGE TO CMD NON-WARP, NON-BURN SLIP JACKETS



On jackets up to 8" deep, *Single* reinforcement angle irons are used.

On jackets over 8" deep, *Double* reinforcement angle irons are used.

They refuse to "fuse" but strip *clean* from the mold every time! CMD Slip Jackets shed molten metal like water off a duck's back. Made of Monasbestos one-half inch thick, these jackets won't burn.

Warping is prevented by strong corner irons 2" x 2" x 1/8", and cross reinforcing irons 1" x 1" x 1/8", which are bolted to the jacket and arc-welded in place.

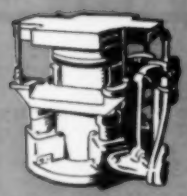
Cut production delays with CMD Slip Jackets. They are your answer to lower jacket costs.

Write Today for Descriptive Circular!

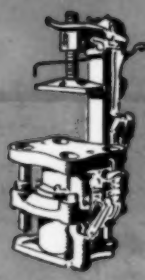
CHICAGO MANUFACTURING & DISTRIBUTING CO.

Dept. F, 1928 West 46th Street Chicago 9, Illinois

JOLT SQUEEZER



PIN LIFTER

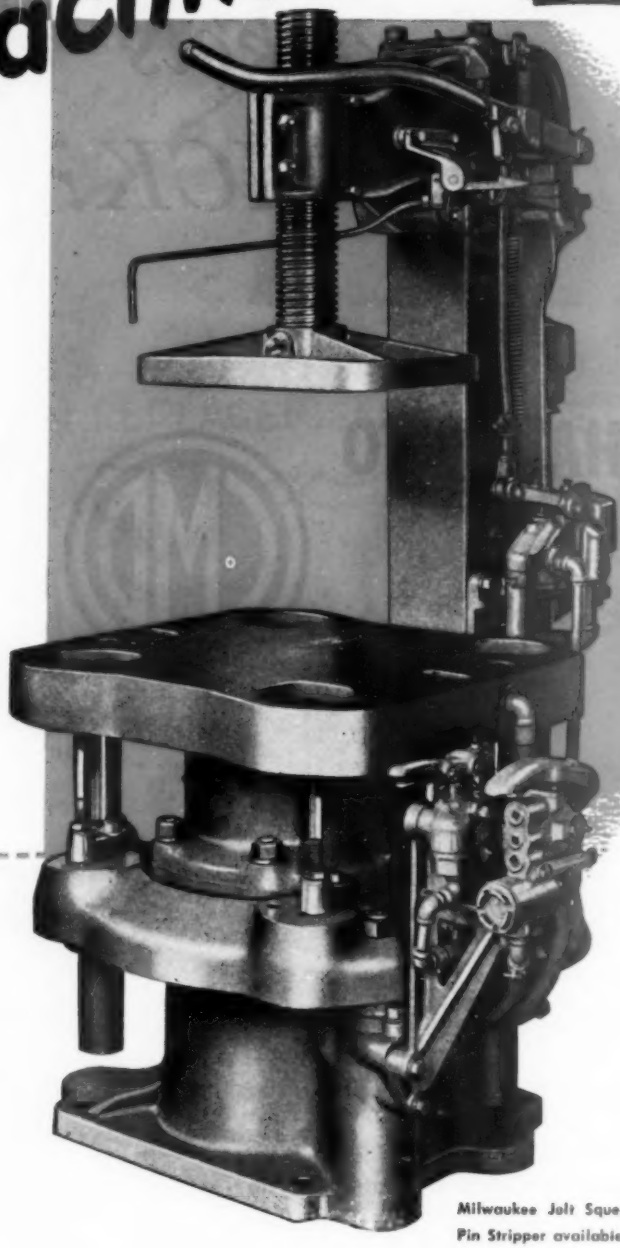


PIN STRIPPER

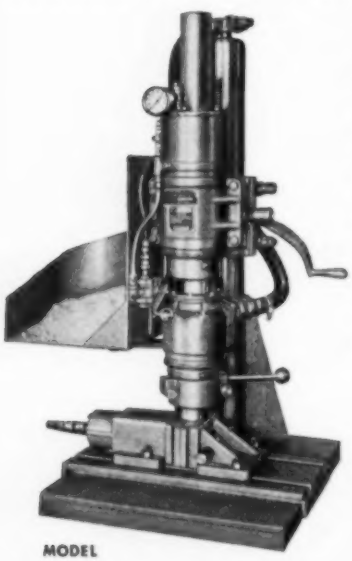
3 Molding Machines in 1

Here's a molding machine that's really versatile. The Milwaukee Jolt Squeeze Pin Stripper operates as a Jolt Squeezer . . . Pin Lifter . . . or Pin Stripper. It's like having three molding machines in one.

The drawing mechanism can be operated on the exhaust of the squeezing stroke as a Stripper, or as a separate operation after squeezing as a Pin Lift. The machine handles simple, inexpensive pattern equipment, enabling you to put troublesome short-run jobs on fast production schedules. It is machined to close tolerances and is accessible from all three sides. Write for complete information on this modern, versatile "Triple Threat" molding machine. 5 sizes available. Ask for Bulletin No. 110.



Milwaukee Jolt Squeeze Pin Stripper available in 5 sizes.



MODEL NO. 3A

30% More Blow Pressure with Milwaukee-Taccone Bench Style Core Blower

This modern, bench style machine blows intricate cores up to 4 lbs. in weight. Synchronized clamping and blowing increase speed and efficiency. Blown cores automatically released, can be removed as fast as blown. Blower steps 90 lb. line pressure up to 120 lbs. blowing pressure. Also heavy duty Core Blower with 100% more blow pressure. Ask for Bulletin No. 119A.

Piston Size Calculator

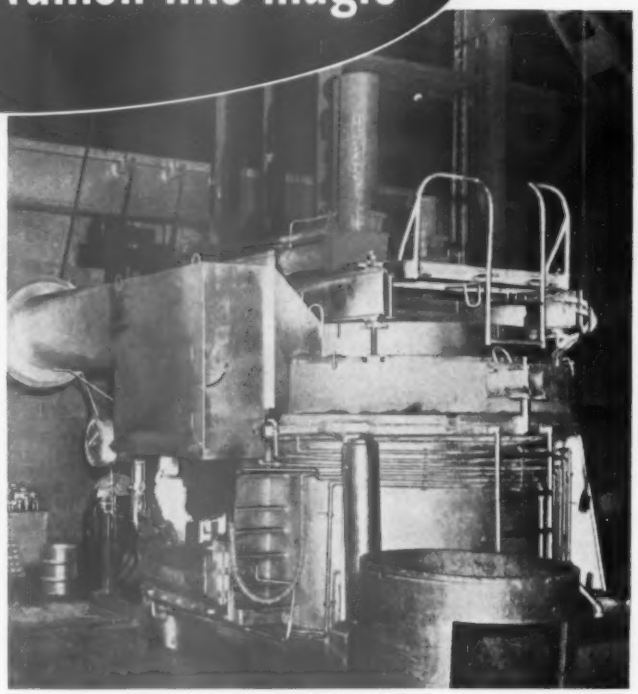
Milwaukee Foundry Equipment Engineers have devised this handy calculator for determining the uniform mold hardness and size of squeeze piston. It's FREE! Send for your Calculator — today!

CORE BLOWERS • CORE GRINDERS • MOLDING MACHINES • BRIQUETTING PRESSES

MILWAUKEE Foundry Equipment Co.

3236 W. PIERCE STREET, MILWAUKEE 4, WISCONSIN, U.S.A.

Smoke and fumes vanish like magic



"Our AAF Furnace Hood has done more to clean up the atmosphere in our steel foundry than any other piece of equipment we have installed." **The Locomotive Finished Material Co. Atchinson, Kansas**

THERE'S really no trick to cleaning up an electric furnace. Pictured at left is a ten-ton OT Lectromelt at The Locomotive Finished Material Co., Atchinson, Kansas. It's spouting the usual quantity of smoke and fumes associated with this operation.

At right, you see this same unit after installation of an AAF Furnace Hood and a Type N Roto-Clone*. Despite the fact that oxygen is used for certain refining stages of the cycle, flame, smoke and fumes are under complete control at all times.

The AAF Hood is designed not to interfere with furnace movement for pouring, slagging or charging and is applicable to either side or top-charge furnaces of all makes and sizes. The Type N Roto-Clone applies positive local exhaust at the electrodes, charging door and pouring spout; scrubs oxides and smoke from the airstream thereby eliminating a potential public nuisance problem.

If you're looking for a practical and proven method for converting your electric furnace into a smoke- and fume-free operation, just call your local AAF representative or write direct to:

AMERICAN AIR FILTER COMPANY, INC.
266 Central Avenue, Louisville 8, Ky.
In Canada: Darling Bros., Ltd., Montreal, P. Q.

MEMBER FOUNDRY EQUIPMENT MANUFACTURERS ASSOCIATION

AAF

ROTO-CLONE®
DUST CONTROL EQUIPMENT

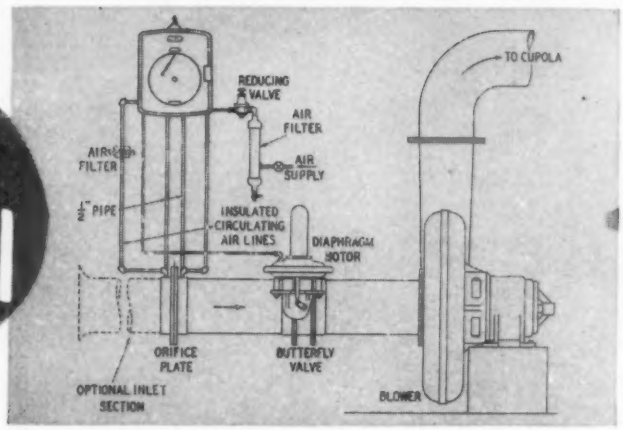
**Roto-Clone is the trade-mark (Reg. U.S. Pat. Off.) of the American Air Filter Company, Inc., for various dust collectors of the dynamic precipitator and hydrostatic precipitator types.*

DETROIT PUBLIC LIBRARY

Broaden Your Benefits from Advanced Foundry Practice

with this

New, Improved Air-weight Control



This is a typical installation set-up of Foxboro Air-Weight Control . . . readily adaptable to either a centrifugal blower (shown in diagram) or a positive displacement blower.

Over 1000 leading foundries are benefiting today from Foxboro's patented air-weight control...through better heats, better pours, higher quality castings, increased production or fewer rejects.

Now . . . new, improved air-weight control is available to meet new conditions in foundry operations. It's designed around the completely-new Model 40 Air-Weight Controller. This new instrument operates on the same basic principles as the earlier models . . . but, it's built to withstand higher operating pressures . . . its control action is improved . . . and it's more convenient, more accessible, easier by far to maintain.

Now . . . you can make the most of advanced foundry practice by installing Foxboro advanced-design, air-weight control. Installation is easy and fast. Results, based on past records, will far outweigh the modest investment required. Write for complete details...today. **The Foxboro Company, 32 Neponset Ave., Foxboro, Mass., U. S. A.**

Here's the new Model-40 Air-Weight Controller. Available for either yoke or flush mounting. Flush mounting permits combination with Pressure Recorder and other cupola instruments on central panel. New pressure and temperature compensator operates over wider range to take care of higher blast pressures . . . also, cupola operation in high altitudes.

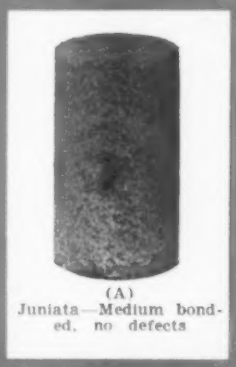
New compensator broadens the field of application for air-weight control. Housed in separate compartment on back of case.

FOXBORO REG. U. S. PAT. OFF. **AIR-WEIGHT CONTROLLERS**

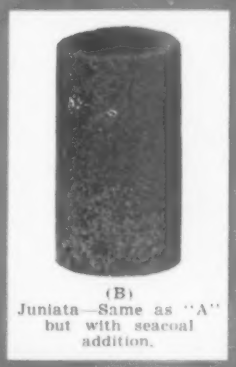
Juniata

The UNIVERSAL FOUNDRY SAND

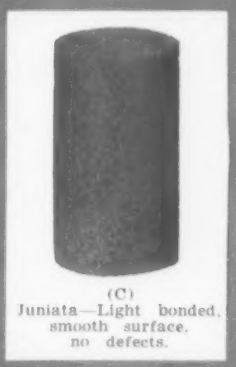
STANDS UP!



(A)
Juniata—Medium bonded, no defects



(B)
Juniata—Same as "A" but with seacoal addition.



(C)
Juniata—Light bonded, smooth surface, no defects.

(D)
Juniata—Light bonded, same as "C" with seacoal addition.

• Pictured above are samples of Juniata Bank Sand after being subjected to the shock test at 2500° Fahrenheit. Note the absence of surface deformities—more proof that Juniata Bank Sand can take it.

In contrast to the Juniata specimens, note how other sands failed when subjected to the same test, as shown below.

FAILURE
Sand caused scabbed casting.

FAILURE
Sand produced rat tails.

FAILURE
Sand buckled, scrapped casting.

FAILURE
Iron particles, poor conditioning.

JUNIATA SANDS—AN EXCLUSIVE GREAT LAKES PRODUCT

Great Lakes Foundry Sand Co.

UNITED ARTISTS BLDG. **DETROIT 26, MICHIGAN**

MINERS — PROCESSORS — FOUNDRY, METALLURGICAL AND SAND BLAST SERVICE

Entire weight of *Foundromatic* shakeout plus casting and sand load is carried on springs which absorb 90% of operating vibration. Centrifugal force is only load on shaft and bearings. Long spring life assured by spring bumper guide design. Body is one piece welded, stress-relieved structure.

Shakes Out 1420 Tons in Nine Hour Shift!

FLOOR CAPACITY was increased in this Cincinnati, Ohio, foundry when two 8 x 10 ft *Foundromatic* shakeouts were installed in parallel. Foundry superintendent reports this multiple unit handles flask loads up to 71,000 lbs. In one nine hour shift they average as high as 40 complete molds!

You can get similar efficiency with *Foundromatic* shakeouts. Available in eight sizes ranging from 4 x 6 ft with capacity of four tons, to 8 x 10 ft with capacity of 25 tons. Multiple shakeouts are installed with capacities of 100 tons or larger.

Flask breakage is cut to a minimum with *Foundromatic* shakeouts because load is evenly distributed over the deck during operation.

For additional information, call your nearby Allis-Chalmers Sales Office or WRITE FOR NEW BULLETIN 07B6365A.

ALLIS-CHALMERS, 1032A SO. 70 ST. MILWAUKEE, WIS. A-2745

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

Foundry Equipment for Bigger Output-Better Working Conditions!

VIBRATING SCREENS | CUPOLA BLOWERS | MOTORS-DRIVES-CONTROL | FOUNDROMATIC CORE DRYER | INDUCTION HEATING & MELTING | REGULEX ARC FURNACE CONTROL

Enthusiasm pays

Enthusiasm is hard to buy . . . it's spontaneous. Ingersoll-Rand Air Tools help instill that invaluable enthusiasm by enabling operators to do their work with less effort.

*Three riveting crews using 16 lb. riveters had extreme difficulty maintaining production due to fatigue. New I-R lightweight, powerful riveters weighing 6 lbs. less were put on the job. Result—the men were happy, no more complaints about fatigue—production was easily maintained and the new equipment paid for itself in 12 days.

Give your workers and yourself the advantages of I-R Air Tools. Just call your Ingersoll-Rand branch for a demonstration in your own plant. They will gladly make the arrangements without cost or obligation to you.

AIR POWER ..... The Key to Lower Production Costs

*Write for Form 5010A, the "Little Book with Big Money-Saving Ideas," which contains nearly 100 authentic case histories on how I-R Air Tools quickly paid for themselves.

323-8

ROCK DRILLS • COMPRESSORS • AIR TOOLS • BLOWERS • CENTRIFUGAL PUMPS • OIL & GAS ENGINES • CONDENSERS •

Ingersoll-Rand

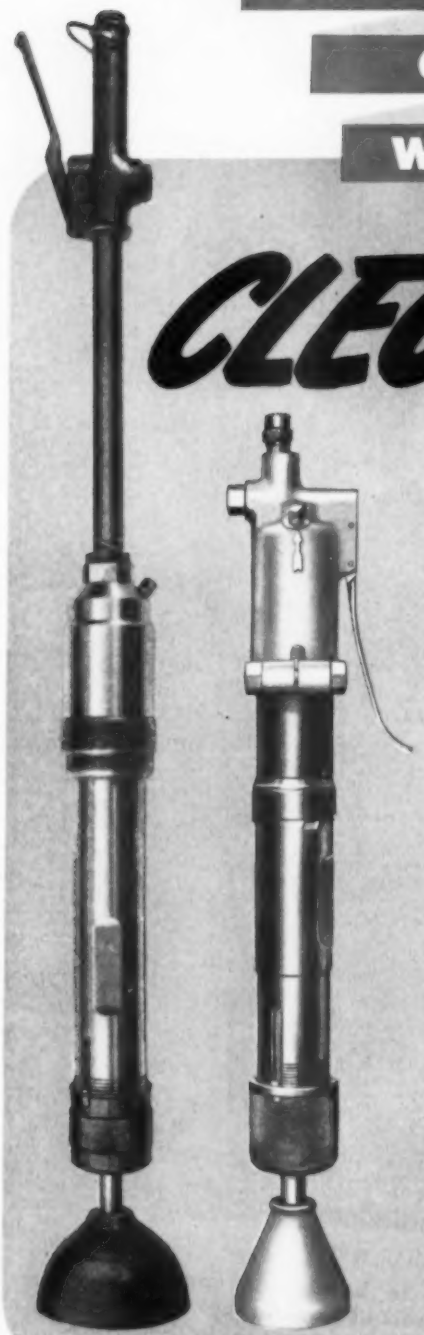
11 Broadway, New York 4, N. Y.

UNIFORM MOLDS

COST LESS

WHEN YOU USE

CLECO RAMMERS



...for faster production of high quality castings

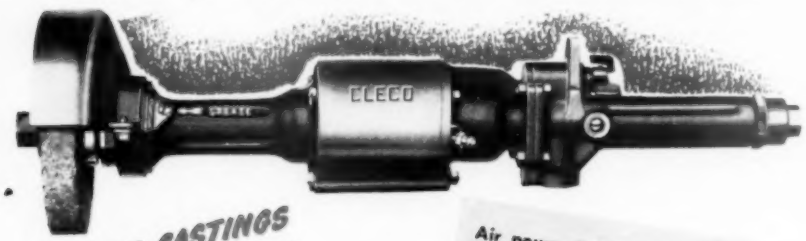
The Cleco "Wafer" Valve provides the piston with a fast action and powerful penetration that saves production time and assures uniform molds.

The Cleco Throttle Valve provides the operator with a "feather" touch. Cleco Rammers are well balanced for easy handling.

The wiper ring construction of the piston rod packing excludes dirt and, with a built-in lubrication system, assures long trouble-free service.

There is a Cleco Rammer for every job. A wide variety of sizes in both floor and bench types is available.

Write for your free copy of Bulletin 76-B for full details.



SMOOTH UP CASTINGS FASTER WITH CLECO GRINDERS

Cleco manufactures a complete line of superior horizontal and vertical grinders. Write for your free copy of Bulletin 80-A for full details.

Air power is safe, clean, flexible and highly productive. For air-powered tools built to highest quality standards, insist on CLECO air tools, bearing this familiar trade mark

CLECO

Back of CLECO Products . . . with 25 years experience in precision manufacturing, is the REED ROLLER BIT COMPANY, one of the largest companies of its kind in the world.

- **CLECO MAKES AIR TOOLS FOR EVERY PURPOSE** — Grinders — Sanders — Rotary Drills — Riveters — Sand Rammers — Chippers — Scaling Tools — Impact Wrenches — Screwdrivers — Hose Fittings — Sump Pumps.

CLECO AIR TOOLS — CLECO ACCESSORIES

CLECO DIVISION

of the REED ROLLER BIT COMPANY, P. O. Box 2119, Houston 1, Texas, U.S.A.

DIVISION OFFICES

San Francisco 5, California 607 Market Street, Room 304	Newark 4, New Jersey 75 Lock Street	Chicago 6, Illinois 121 N. Jefferson Street	St. Louis 3, Missouri 2322 Locust Street	Philadelphia 33, Pennsylvania Mascher at Lippincott St.
Hollywood 46, California 8709 Santa Monica Blvd.	Worcester 2, Massachusetts 6 St. Elmo Road	Cincinnati 2, Ohio 431 Temple Bar Bldg.	Atlanta 3, Georgia 502 Peters Bldg.	Pittsburgh 22, Pennsylvania 109-11 Wood Street

In Canada: Cleco Pneumatic Tool Company of Canada, Ltd., 927 Millwood Road, Toronto (Leaside), Ontario

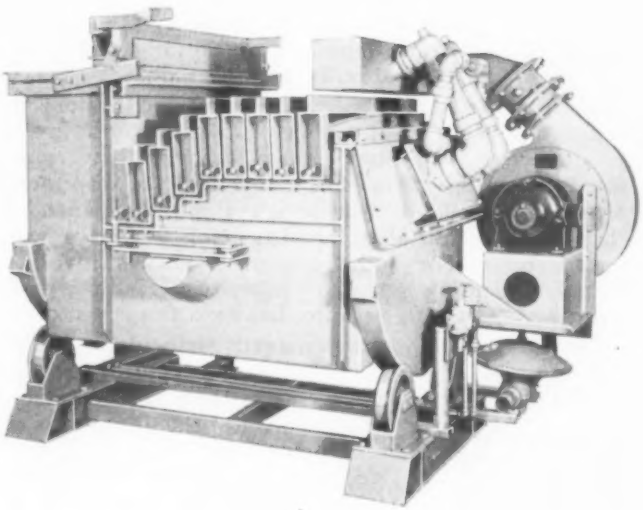
DISTRIBUTORS IN PRINCIPAL CITIES OF THE UNITED STATES AND THROUGHOUT THE WORLD

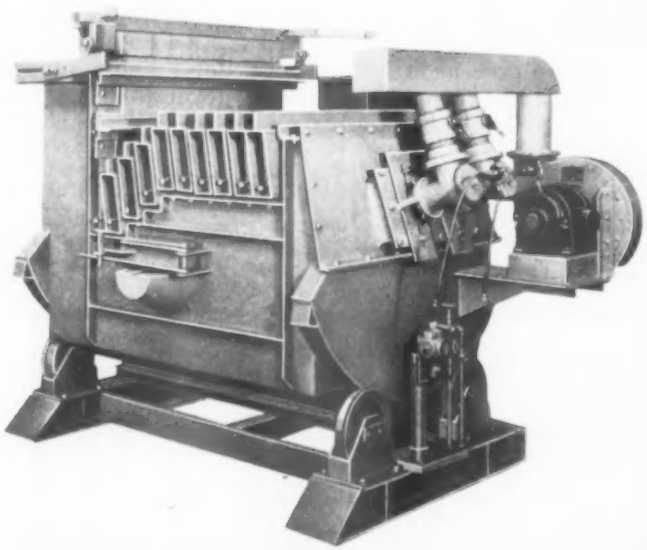
LOOK! GRAY IRON FOUNDRYMEN!

DAILY, PROFITABLE OPERATION DURING SLOW TIMES OR PEAK PERIODS WITH THESE SENSATIONAL NEW STROMAN ECONOMELT FURNACES

Here's What You Can Count On:

1. Flexibility
2. Controlled analysis of iron
3. Prompt service to customers
4. Control of physical properties
5. Turnover of molding floors and flask equipment several times daily
6. Full use of a minimum amount of labor
7. Temperatures in excess of 2800° F. easily attained
8. Excellent for use on special analysis and alloy irons
9. Sizes up to 5000 lbs. capacity per heat





Being able to pour off your floors several times daily eliminates the necessity of bringing in a full crew of men to keep an iron foundry operating daily. With an Economelt all that is needed is a short preheating period at the beginning of each day. One and one-half hours after the first charge molten metal will be ready to pour into the molds. This means that the molding floor and flask equipment can be turned over several times a day, enabling you to give your customers excellent service.

Chemical analysis can be controlled very closely with Stroman Economelt Furnaces, therefore affording good physical properties on all castings. This assures your customers of a good machinable product. With this unit you can meet competition with a quality product and maintain low production costs, which assure greater profits.

INVESTIGATE these Stroman Economelt Furnaces for Gray Iron . . . they have proved their efficiency and are now in operation in many gray iron foundries . . . Drop a note for full information . . . Do it to-day.

STROMAN FURNACE & ENGINEERING CO.

DIVISION OF

THE PETERSEN OVEN CO. • 9900 FRANKLIN AVE. • FRANKLIN PARK, ILL.

LET'S KICK IT AROUND

By TOM BARLOW

By the shores of Minnie-muddy
Stood a foundryman full puzzled;
Stood a foundryman disgusted
With his sand in second gear.

— Apologies to everybody.

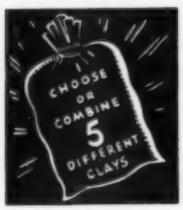
Once upon a time a man borrowed a car from a friend with an "automatic" drive (the car — not the friend). After driving all over the state of Wisconsin he complained that the car was sluggish and slow. Come to find out, he had been driving in low all the time. Moral: *Never lend a man something until you show him how to use it.*

I wonder how many sand systems are running in second. They may run all right that way. They may make good castings that way. They may even be easier to run — when a man drives a car in second he is less apt to hit a tree than if he is in high. We argue that if a sand system is making good castings, there is no point in changing. The foundryman has enough to do without changing something that isn't giving trouble. On the other hand, maybe if we shifted into high gear we could get there faster and have more time to devote to other problems.

Is your sand system efficient? Does your cigarette taste different lately? Does your sand have maximum flowability? Does your breath offend? Do your feet hurt? Have you ever tried Dixie? . . . Seriously, it is possible to make castings of almost any type, using almost any type of synthetic sand or even natural sand. By unusual gate design, special facings, special treatment or extensive additions you can even make acceptable castings. However, there is probably only one *best* way. The best way is the most economical way. The economical way is the way to stay in business.

There are three ways to cut costs in a foundry and to increase profits: (1) Reduce molding costs, (2) Reduce metal and finishing costs, (3) Reduce sand costs. Of course you could also get rid of all the expensive overhead such as President, Vice-President, Manager, Superintendent, Foreman, etc., but we can ignore that method.

Of the three methods of cutting costs, *maybe* a good look at the sand practice would pay. That doesn't mean just buying a cheaper sand or clay. Maybe that is the answer — but maybe the opposite is true. The sand cost involves more than the price per pound of sand, clay and special additions. How much does your shake-out cost? How much is sand adding to your cleaning and chipping expense? How much penetration are you grinding off? How much time is lost by poor flowing sand? How many flasks are you breaking trying to shake-out? How much spray and wash is wasted to counteract an open sand? How much cereal is wasted because the grain distribution is wrong?



If you are using Black Hills Bentonite, maybe you should be using Dixie or vice-versa. A lot depends upon what castings are being made and upon the cheapest good sand available. For example, if you have a good local sand with a high permeability, maybe you can use Revivo to best advantage. It will reduce the permeability and close up the sand. Or suppose that your local sand is good except that it shows low permeability. In that case use Dixie because it gives maximum permeability. If Dixie alone gives too much flowability for some jobs and gives some scabs, cut it with a little Black Hills — and so on.

With natural sand you are pretty well limited in properties depending upon which "hole-in-the ground" the sand came from. With synthetic sand you can juggle various clays to obtain the maximum properties available. Maybe it's a darn nuisance to change sand, but then making money always was troublesome. For some reason it always involves work — assuming you can't inherit it. Habit is like a soft bed — easy to get into, but hard to get out of.

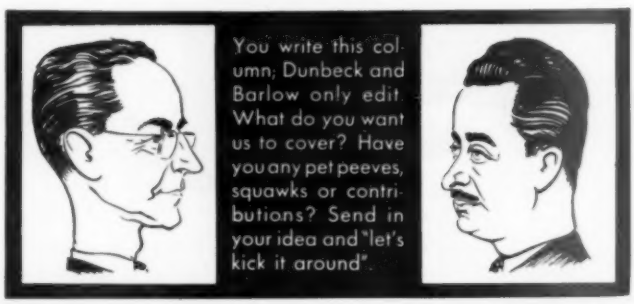
To choose a bond clay correctly, consider: (1) the size and type of work, (2) the sand handling equipment available, (3) the characteristics of the cheapest good sand, (4) the limitations of the equipment for shake-out, etc., (5) the type of molding equipment, and (6) the finish and appearance of the casting. After that, make sure you are getting the best clay of its type available. Above all, choose your sand practice to fit your foundry — don't be dictated to by a hole in the ground. Never let it be said you don't know your molding sand from a hole in the ground.

★ ★ ★

EASTERN CLAY PRODUCTS, Inc.

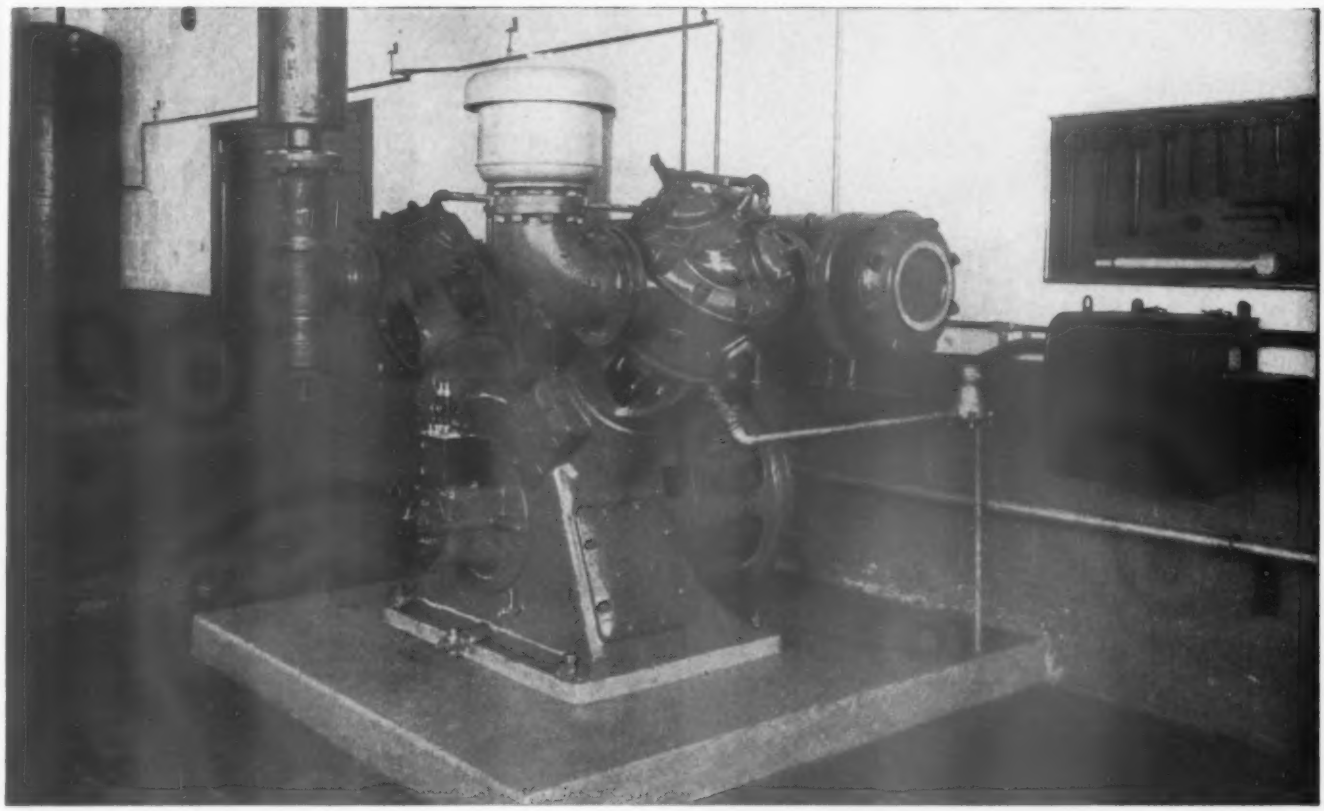
"Bonding clays sold with service"

JACKSON, OHIO


You write this column; Dunbeck and Barlow only edit. What do you want us to cover? Have you any pet peeves, squawks or contributions? Send in your idea and "let's kick it around".

DIXIE BOND • BLACK HILLS BENTONITE • REVIVO BOND • REVIVO SUPER BOND • BALANCED REVIVO

ADVERTISEMENT



Here's top efficiency in the 400 to 1800 c. f. m. range!

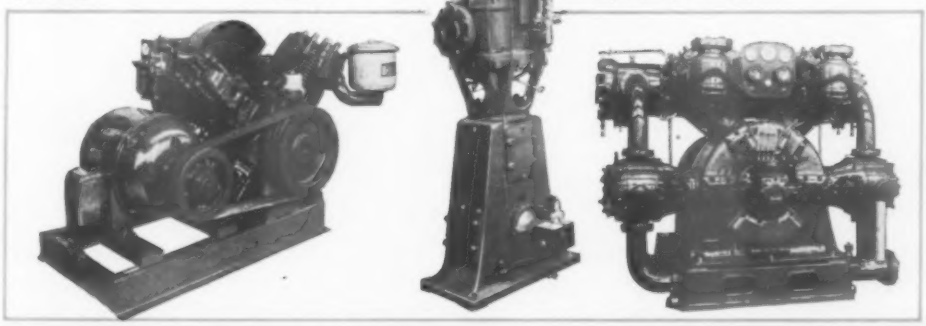
The JOY WN-112 AIR COMPRESSOR

Built in sizes from 378 to 1828 CFM, the JOY WN-112 is a two-cylinder, two-stage, heavy-duty compressor with the exclusive JOY "Dual-Cushion" valves for top efficiency. Compact and highly modern, it saves space and cuts installation costs. ● JOY builds the most modern compressors available for either centralized or de-centralized air supply—*write for Bulletin.*

The JOY WL 80, in nine sizes from 81 to 590 CFM.

The JOY WG 9, in eleven sizes from 153 to 822 CFM.

The JOY WN 114, in single or twin units, 1092 to 7312 CFM.



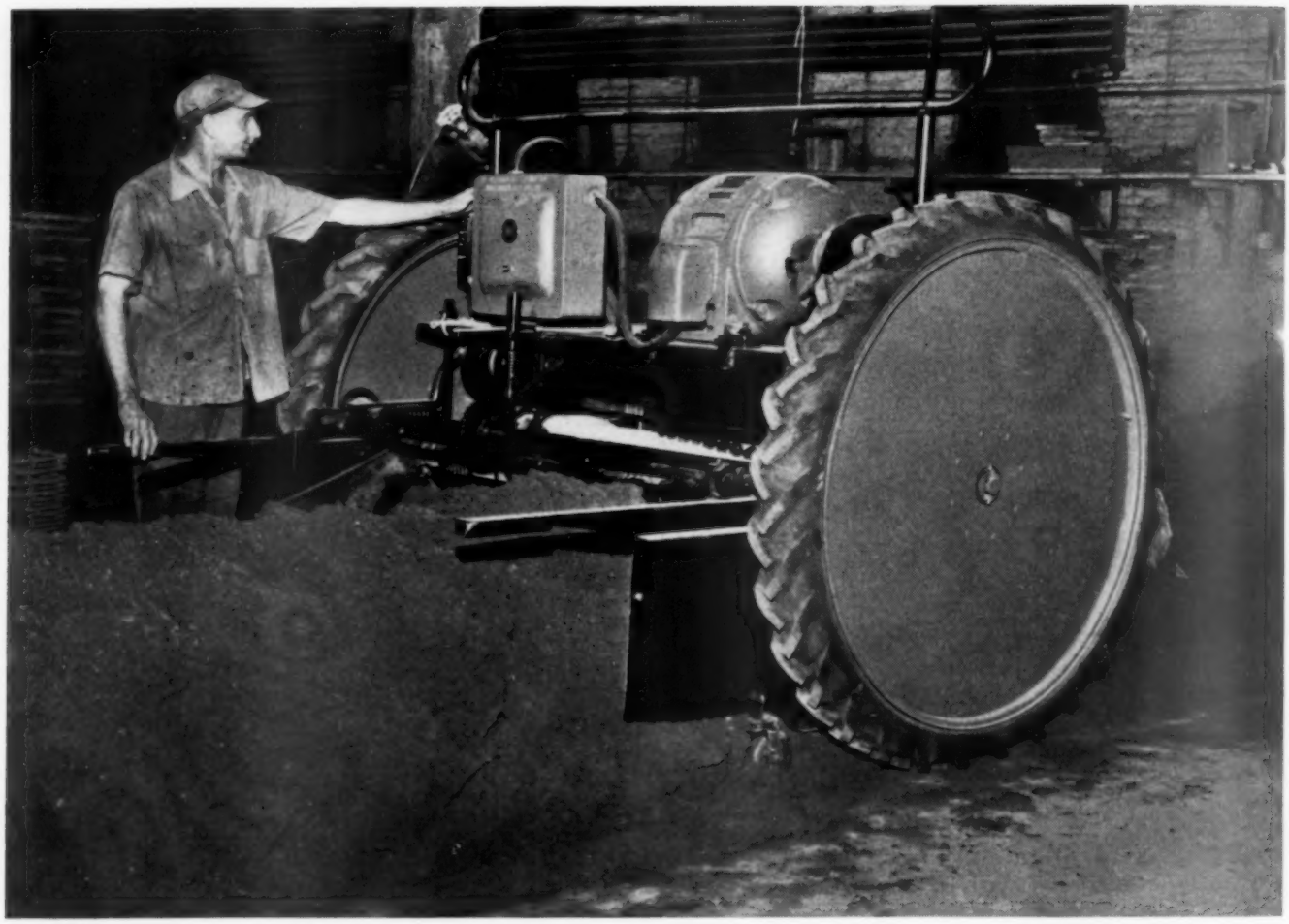
Consult a Joy Engineer

W&D 12055

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING · PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO



"The Moulders' Friend" **conditioning more than two tons of sand per minute in a Pennsylvania foundry.**

"The Moulders' Friend" **Fits Your Foundry.** Carried on two large pneumatic tired wheels, it rolls easy and turns short in the crowded foundry under the complete control of one man—No experience required to operate—Saves labor shoveling.

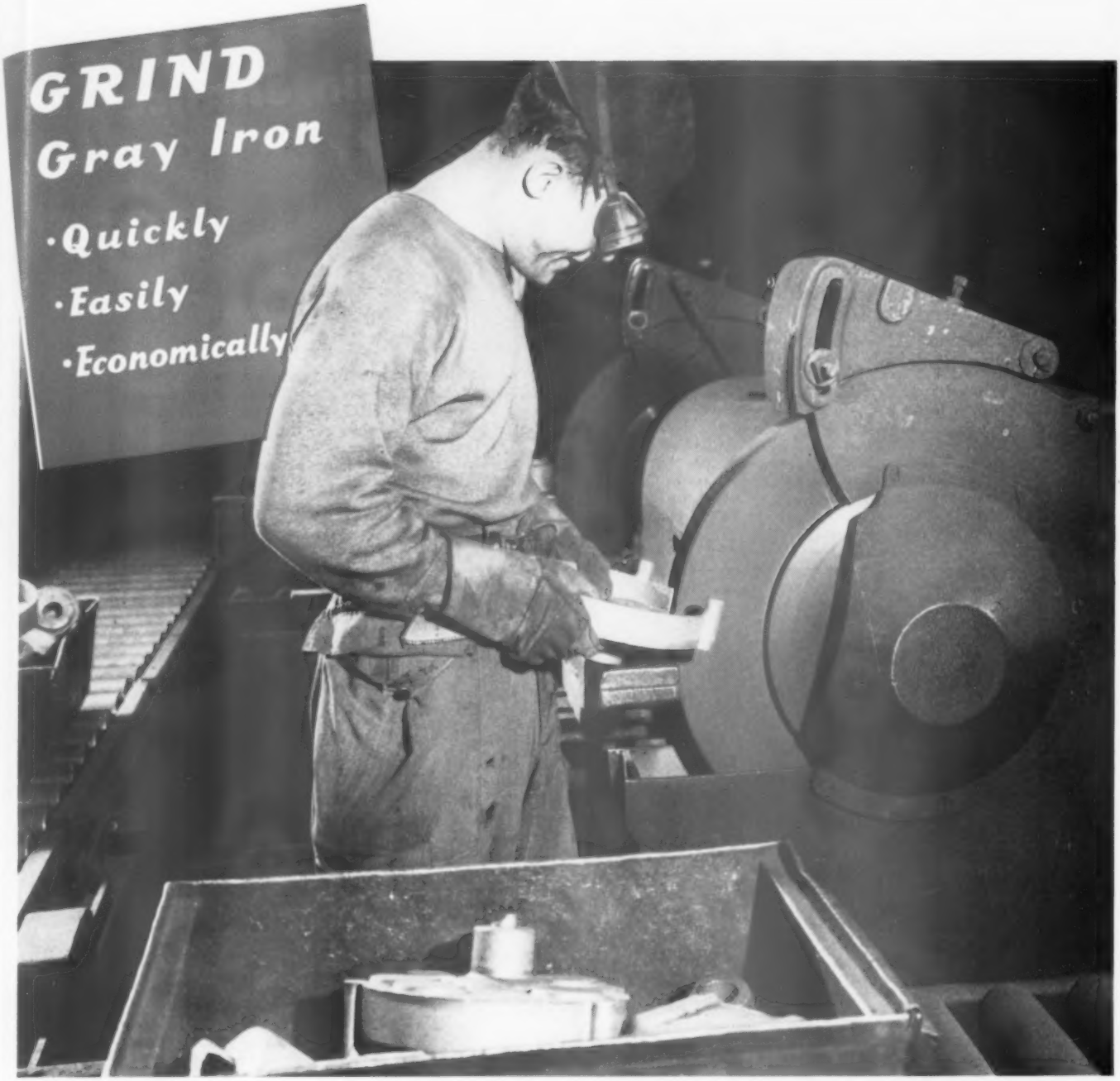
"The Moulders' Friend" **Improves the Condition of Your Sand Heaps.** The brush does the job. Thousands of flat tempered steel wires in the brush revolving at high speed pick up small particles of the used sand, added bond and moisture and blend them thoroughly. The action is so thorough that clay bond and water can be blended with the sand in one trip over the heap.

"The Moulders' Friend" **conditions *all* the heap.** As it travels over the heap it gathers *all* of the sand from the floor, pulverizes the lumps and blends it thoroughly, avoiding the layer of dry, unconditioned sand sometimes found next to the foundry floor.

"The Moulders' Friend" **Is Easy to Buy and Maintain.** Simplicity of construction with few moving parts keeps down original and replacement costs. High speed chain drives run in dirt proof, oil tight cases.

Investigate this remarkable machine. Your neighbor has one. May we arrange a demonstration? If you want satisfied moulders making quality castings write us now.

"The Moulders' Friend", **Dallas City, Ill.**



Use CRYSTOLON Wheels on Your Floor Stands, Swing Frames, and Portables!

CRYSTOLON wheels from 6" to 24" in diameter for floor stands—with vitrified bond for speeds up to 6500 s.f.p.m., and with resinoid bond for high speeds—enable you to grind castings of gray iron or malleable iron quickly, easily, and economically. They remove stock rapidly—break down slowly—require less dressing—and cut clean without objectionable "bounce"!

CRYSTOLON wheels give you similar results on your swing frames. And small CRYSTOLON wheels for your portables have the same cost-cutting features as larger Norton wheels, and are backed by the same extensive research, manufacturing and engineering facilities of Norton Company—the world's largest producer of abrasives and grinding wheels.

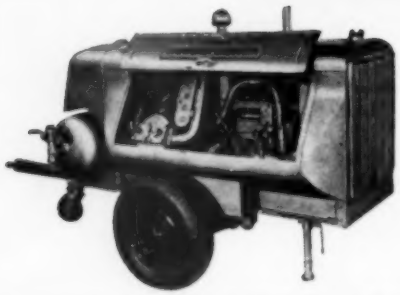
NORTON COMPANY • WORCESTER 6, MASS.

Distributors In All Principal Cities — See Your Classified Telephone Directory

W-1200

NORTON ABRASIVES

First Aid for Plant Maintenance



AIR POWER WHERE YOU NEED IT—WHEN YOU NEED IT . . . Gardner-Denver WHD-105 Portable Air Compressor brings dependable, low-cost air power to the job location. Two-stage compression and completely water-cooled cylinders assure plenty of air for maintenance work in any season, at any altitude, regardless of weather conditions. Air-cushioned plate type valves are quiet, efficient and durable.

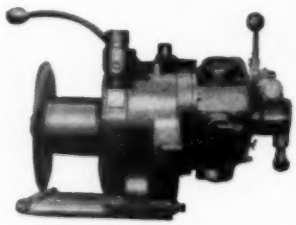
QUALITY CONSTRUCTION IN A SMALL COMPRESSOR . . . Gardner-Denver Air-Cooled, Tank-Mounted Compressor Outfits are made with the same care as the famous Gardner-Denver large capacity compressors. Their long-life records are the result of quality features such as drop-forged steel crankshaft, roller main bearings and plate type air valves. Useful for paint spraying, cleaning, operating air tools, tire inflation, etc.

POWER—PLUS SAFETY... Gardner-Denver B87 Paving Breaker is a hard-hitting tool for rapid pavement breaking, foundation demolition, sheeting driving, etc. Exclusive safety latch prevents accidents. Lighter models are available.

RUGGED—AND EASY TO HOLD . . . Gardner-Denver T23 Backfill Tamper is powerfully built, yet is smoothly balanced for easy "walking" over the fill. Piston rod packing and butt attachment are designed to minimize maintenance.

A VERSATILE TOOL . . . Gardner-Denver Model 28 Clay Digger makes fast work of stiff clay or hardpan. Can be fitted with chisel bit or axe blade for timbering, or with moil point for light demolition. Extension handle converts digger into efficient trenching tool.

EFFICIENT AND DEPENDABLE PUMPING... Gardner-Denver VP4 Pneumatic Sump Pump is designed with top-suction — won't bury itself in a muddy sump. Automatic governor saves air when suction runs dry. For de-watering excavations, emptying tanks, bilges, sewers, etc.



FLEXIBLE HOISTING POWER . . . Gardner-Denver HB Air Hoist is powered by 5-cylinder radial air motor that provides smooth torque for accurate spotting of load. Handy for hoisting, hauling, erection, car spotting, etc. Hoists available for 1000 to 2500 lb. rope pull.

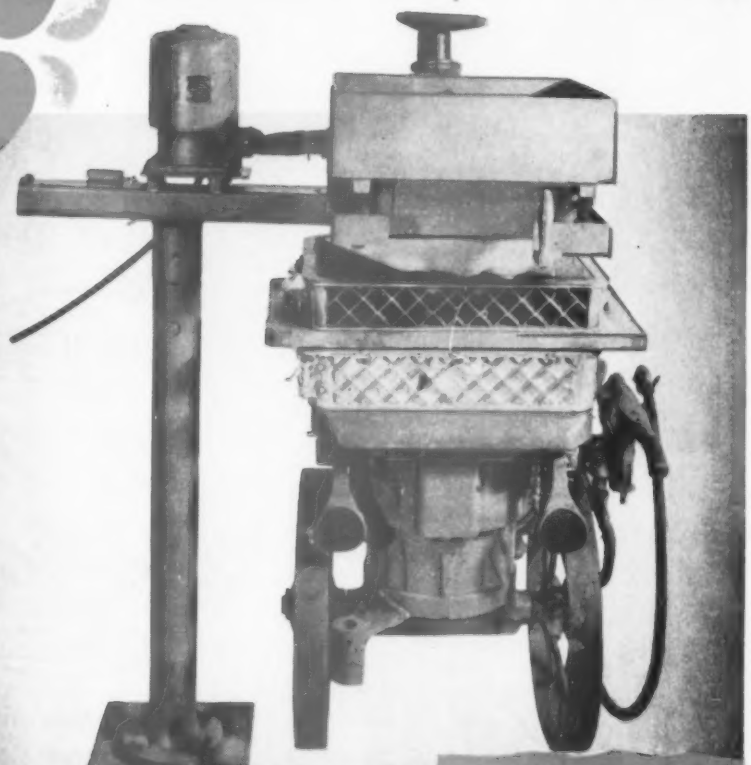
INCREASE AIR TOOL EFFICIENCY with a Gardner-Denver Line Oiler—fully atomizes oil—carefully meters flow—available in three sizes from ½ to 3 pints.

For complete information on Gardner-Denver air compressors and pneumatic tools for plant maintenance, demolition or construction work, write Gardner-Denver Company, Quincy, Illinois.

GARDNER-DENVER

Since 1859

WHY RIDDLE YOUR SAND BY HAND?



RIDDLING sand by hand is a familiar, but unnecessarily hard, way to do the job. No molder needs to continue this back-breaking routine that is just one more way to wear himself out by the end of the day.

Model Illustrated Standard Single Channel $365.00

Standard Double Channel $385

THE Roller Riddle, a new product with years of research behind it, in a matter of seconds riddles sand onto the entire surface of the Pattern plate easily and evenly. A special designed 1/4 h.p. motor, combined with a limit switch, automatically activates the riddle basket, oscillating 900 times per minute.

There is no sand wasted and the 31" travel of the riddle on the channel makes the machine highly flexible. Sealed roller bearings throughout. No lubrication necessary. Shaft is covered with tube rubber eliminating the possibility of sand or dirt in the motor.

The Roller Riddle, with a sand capacity of 65 pounds, is not an experiment, but a reality. Machines have been in round-the-clock operation without mechanical failure for over 3,000 hours. Send for our new catalog.

Send For New Descriptive Literature

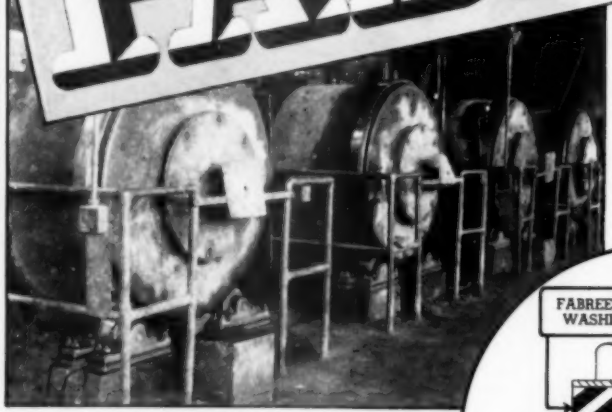
ROLLER RIDDLE CORP.

POST OFFICE BOX 178

PORT HURON, MICHIGAN

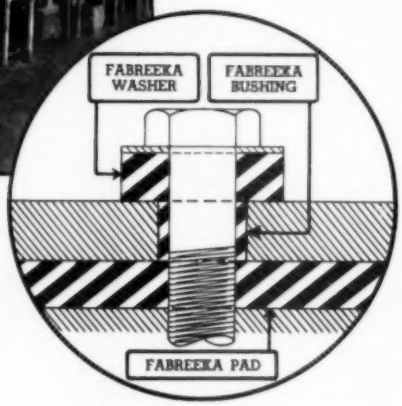
Under All Heavy Machinery

FABREEKA

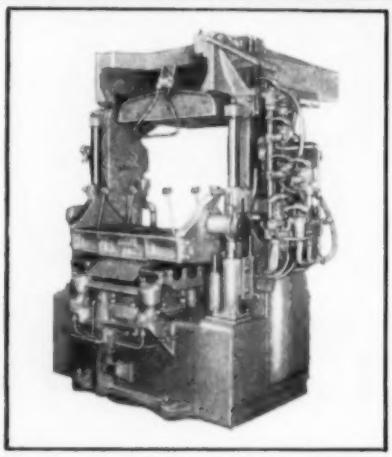


PADS, BUSHINGS, and WASHERS

Absorb Impact Shock and Reduce the Effect of Destructive Vibration

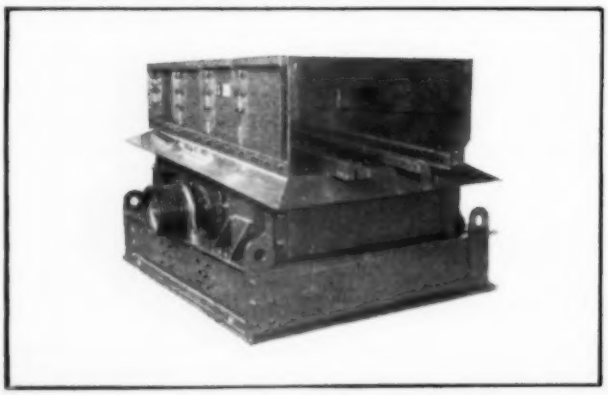


SHOWN AT LEFT
CROSS SECTION OF
FABREEKA INSTALLATION



FABREEKA Pads, bushings, and washers are installed under Shakeout Machines, Jolt Moulders, Tumbling Barrels and other heavy machinery to reduce the effects of heavy impact shocks and destructive vibration.

FABREEKA has demonstrated its ability to prevent breakage of machine parts and to keep bolts tight, thereby reducing maintenance and increasing production. In addition to these important advantages, Fabreeka has long life, which makes its final cost a low cost.



Write for latest literature

It Pays To Specify Fabreeka

FABREEKA PRODUCTS COMPANY, INCORPORATED
222B Summer Street
Boston 10, Mass.

for IMPACT SHOCK and VIBRATION

Electro THRIVES ON GRIEF!

Electro SINCE 1919

Industrialists and their staff or consulting chemists and engineers almost always are surprised at our "open house" policy. Why not? We are far more anxious to collaborate with these visitors in the solving of problems than we are to impress dignity or breed mystery.

While our production runs into sizable volume, we continue to be a "service house" rather than a mass-production plant. Most of our volume-production products, now accepted as standard items in many industries, were originated to meet a specific requirement for some imaginative manufacturer who pioneered better ways, often for his entire industry. If you are trying to do something, notably with a Silicon Carbon product, that has not been done before, or that you think could be done better, we invite your confidence. We now do our own production of this base material, (Electro-Carb) which gives us both latitude and advantage that we never had before.

Electro SERVES THESE INDUSTRIES WITH THESE Electro PRODUCTS

METAL—Non-Ferrous and Ferrous Foundries: Steel Mills and Smelters: Brass Rolling Mills: Heat Treaters and Annealers.

CERAMIC—Potteries: Art Potteries: Manufacturers of Grinding Wheels: Sanitary Ware: Floor and Wall Tile: Electrical Porcelain: Miscellaneous Ceramic and Enamel Plants.

AUTOMOTIVE—Foundry, foundry cleaning, abrasive cutting-off, heat treating, tool room and precision grinding and finishing departments.

CHEMICAL—For applications where high temperatures or other severe operating conditions indicate the use of special refractories and cements.

SHIPBUILDING—Weld grinding, abrasive cutting-off, tool room and precision grinding, foundry, foundry cleaning, heat treating, power plant refractories.

PUBLIC UTILITIES • FEDERAL BUREAUS
STATE AGENCIES • MUNICIPAL DEPTS.

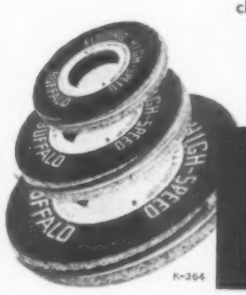
ABRASIVE WHEELS—Resin-bonded, High-Speed Grinding Wheels to cover nearly every conceivable use from snagging and cutting-off operations to fine precision grinding.

CRUCIBLES—(Tercod-Conqueror) Pedestal Blocks and Pot Lids—The Carbon-bonded Crucible for melting aluminum—nickel—copper—the brasses and bronzes—zinc—silver—gold—iron, using any fuel: oil, gas, coke or coal, electricity.

REFRACTORIES—Special Refractories—Electric furnace refractories of all kinds used for:
CERAMIC KILN FURNITURE—Slabs and Posts for rigid, floating or semi-floating open construction; plate setters, tile setters, sanitary ware setters and silicon carbide saggers.
MUFFLES AND HEARTHS—One piece and sectional for enameling furnaces, tunnel kilns, assay and heat treating furnaces, pottery kilns.
CRUCIBLE FURNACE FURNITURE—Linings, covers, insulation, burner blocks.
PYROMETER TUBES—And tubes for other purposes.
BRICK—9" series or special shapes to individual specifications.
BURNER BLOCKS—Electric furnace door blocks, door frames, port blocks and electrode sleeves.
STOPPER HEADS—For steel ladles; also slag hole and tap hole blocks for Cupolas.

CEMENTS—Cements and Ramming Compositions—Of special refractories used by all industries; monolithic linings for electric, gas and oil furnaces; patching furnace walls, laying brick, boiler setting and ladle linings.

ALLOYS—Special compositions for additions, deoxidation, degasification, purification: Copper — Aluminum — Chromium — Titanium — Nickel — Silicon — Magnesium — Iron — Lithium — Calcium — Calcium Boride — Tin — Zinc — Lead.



Electro Refractories & Alloys Corporation

344 DELAWARE AVE. — West Coast Warehouse LOS ANGELES — BUFFALO 2, N. Y.

FERROCARBO Briquettes

THE NEW DEVELOPMENT in malleable iron melting that provides these advantages:

1. Thorough deoxidation.
2. Prolonged increase in fluidity.
3. Less tendency for internal shrinkage.
4. Elimination of shrinkage cracks and hot tears close to or at point where risers feed castings.
5. Less breakage of castings during "shake-out." This results from reduction of massive primary carbides with their marked planes of weakness.
6. The fine, uniform carbide dispersion provides shorter annealing time and evenly distributed graphite nodules.

Actual plant records attest the economies effected by FERROCARBO Briquettes in malleable melting operations. Their possibilities in your plant should not be overlooked. Call in our metallurgical staff for complete information.

FERROCARBO Briquettes

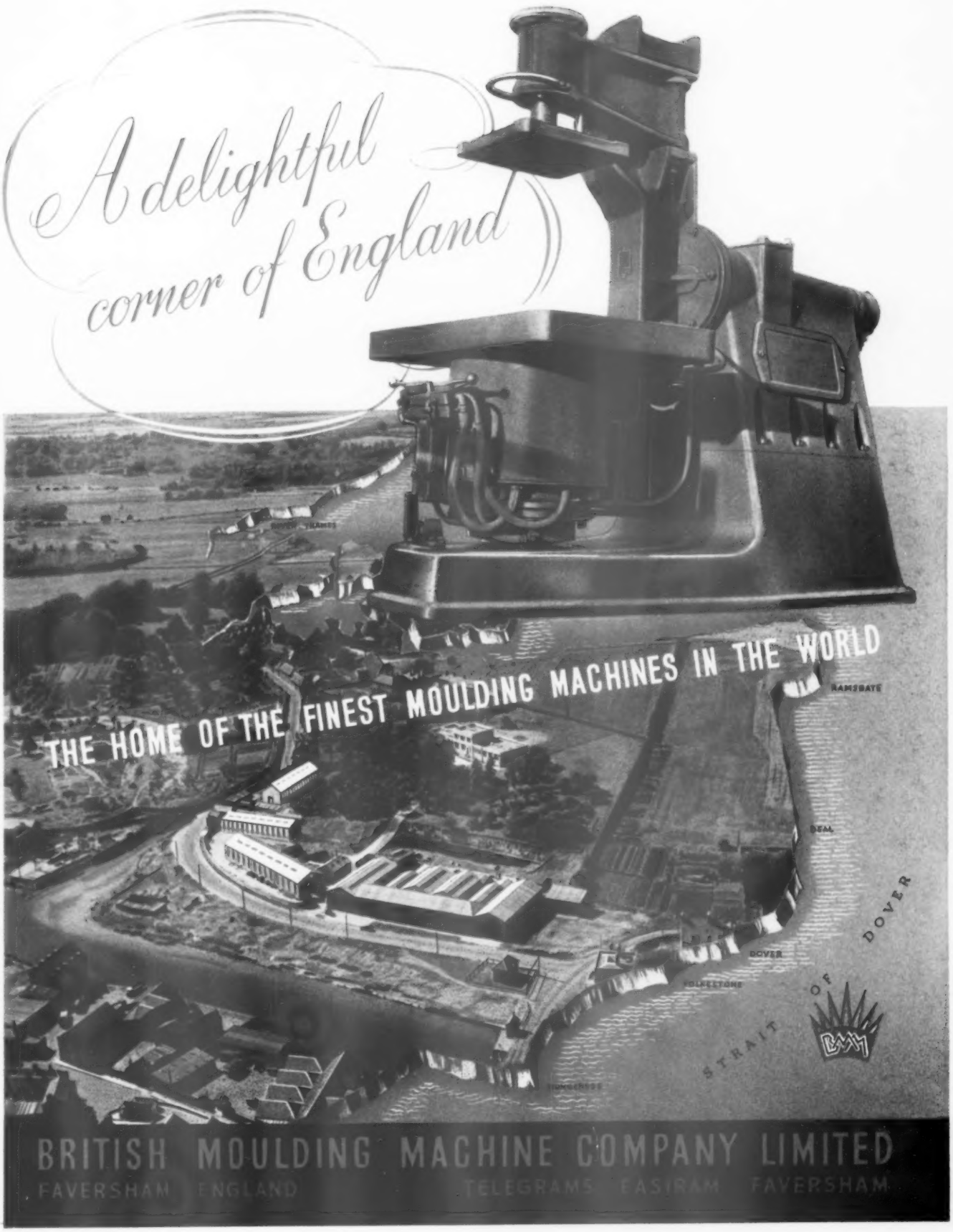
BY CARBORUNDUM

TRADE MARK

THE CARBORUNDUM COMPANY, Bonded Products and Abrasive Grain Division, Niagara Falls, New York

FERROCARBO Distributors: Kerchner, Marshall & Co., Pittsburgh, Cleveland, Birmingham, Philadelphia and Buffalo; Miller and Company, Chicago, St. Louis and Cincinnati

"Carborundum" and "Ferrocarbo" are registered trademarks which indicate manufacture by The Carborundum Company


A delightful corner of England
THE HOME OF THE FINEST MOULDING MACHINES IN THE WORLD
RAMSGATE
DEAL
DOVER
FOLKESTONE
STRAIT OF DOVER
BRITISH MOULDING MACHINE COMPANY LIMITED
FAVERSHAM ENGLAND
TELEGRAMS FASIRAM FAVERSHAM

CASTFLUX

Reduces Casting Rejects To a New Low Point Never Before Obtained In the Industry

CASTFLUX
TRADE MARK REG.

The "National" Dual Purpose Flux

In the Ladle

FLUIDITY
Is Materially Increased Purifying the Metal.

YOU ALSO GET

- Closer Grained Castings
- Fewer Rejects
- Fewer Miss Runs
- Less Remelting
- Longer Ladle Life
- Less Ladle Chipping

at a cost of

10¢ to 15¢

PER TON
OF METAL TREATED

On Both Blind and Open Risers . . .

Castflux raises the temperature of the metal to a higher degree and substantially increases and maintains the fluidity of the metal during the entire cooling-down period.

UNCONDITIONALLY GUARANTEED

Unless Castflux meets with your full approval material can be returned, providing we are notified within 30 days after receipt of material.

NATIONAL

PIGMENT COMPANY
2115-2117 EAST YORK STREET
PHILADELPHIA 25, PA.

INCREASE FOUNDRY PRODUCTION with "dag" Colloidal Graphite

YOU get more efficient foundry operation . . . substantial production increases . . . you have better working conditions . . . when you spray or brush **"dag"** colloidal graphite dispersions on chills, patterns, and permanent molds. Rapid clean parting and smoother surfaces are assured because the exceedingly thin dry film of **"dag"** colloidal graphite resists oxidation, minimizes gas pockets, and permits easy removal of castings.

Foundrymen find that **"dag"** colloidal graphite dispersions do not affect casting . . . dimensions are held to close tolerances. Better mold production is secured, with longer mold life and easier parting; choking fumes and smoke are reduced to a minimum. Also, binding and stripping of push pins, shoulder screws and flask pins are eliminated by brushing or spraying with **"dag"** colloidal graphite dispersions.

An Acheson Colloids engineer will be glad to advise you on how to use **"dag"** colloidal graphite. The coupon will bring detailed information . . . without obligation, of course.

Branch offices in Boston, New York, Philadelphia, Pittsburgh, Cleveland, Detroit, Chicago, St. Louis, Los Angeles, San Francisco, Toronto.

Coating permanent mold at the Thomas Paulson & Son, Inc. foundry, Brooklyn, New York.

ACHESON COLLOIDS CORPORATION
PORT HURON, MICHIGAN

☐ Send me more information
☐ Send a sales engineer at my convenience

NAME_____

COMPANY_____

STREET_____

CITY_____ ZONE_____

STATE_____ G-11

ACHESON COLLOIDS CORPORATION

dag COLLOIDS

Port Huron, Michigan

CUTS YOUR OPERATING COSTS 3 WAYS!

NICHOLLS MOLDING MACHINES

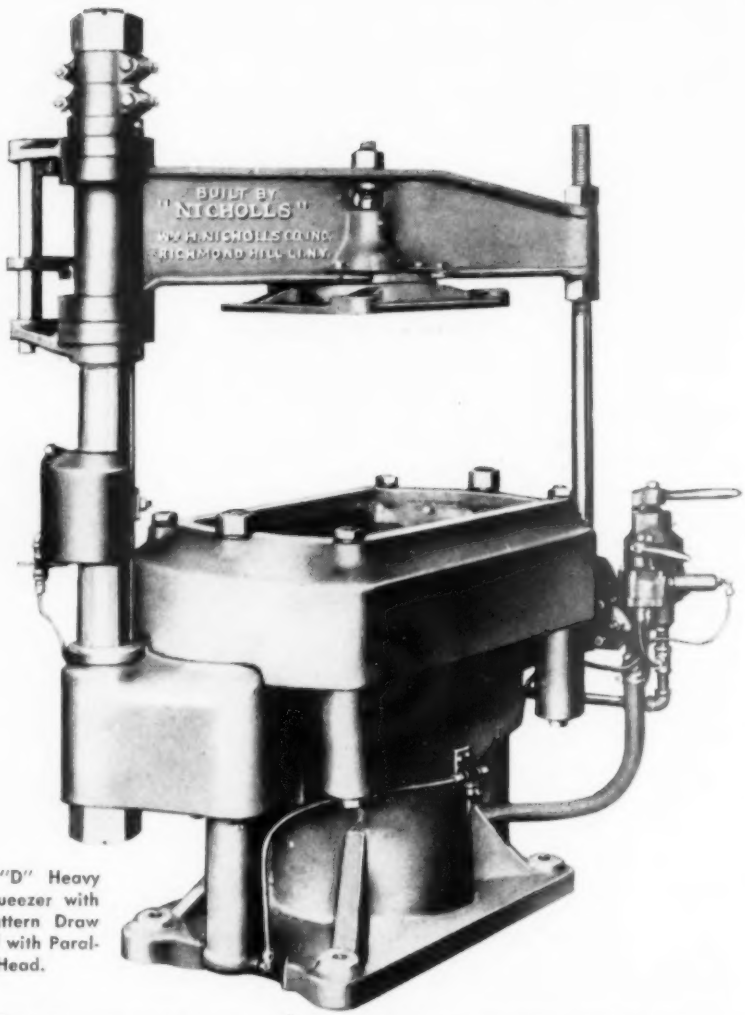
are in their thirty-ninth year of service to the foundry industry. Over these years, we have designed a complete line of stationary and portable types for producing precision molds in endless quantities! These Mechanical Heavy Weights offer you three outstanding advantages in economy . . . .

❶ Withstand the pressure of continuous operation

❷ Meet production schedules on time

❸ New workmen operate Nicholls Machines with ease

We invite your inquiries about specific models . . . stationary or portable.



11-32 Type "D" Heavy Duty Jolt Squeezer with Pneumatic Pattern Draw and equipped with Parallel Squeeze Head.

Wm. H. NICHOLLS Co., Inc. RICHMOND HILL 18, LONG ISLAND, NEW YORK

ESTABLISHED 1910

FOREIGN MANUFACTURERS AND SELLING AGENTS FOR CONTINENTAL EUROPE AND GREAT BRITAIN — GEORGE FISCHER, LTD., SCHAFFHAUSEN, SWITZERLAND

NICHOLLS

HERE'S HOW...

Lindberg-Fisher 2-CHAMBER MELTING FURNACE

BEATS THE HEAT OF SUMMER

—reduces temperature 17°F. at operator's station

A well known Chicago manufacturer of aluminum and zinc die cast products beat the heat by installing this 40 KW Lindberg-Fisher 2-Chamber Induction Furnace for melting aluminum. Temperatures measured at the operator's station (3 feet from furnace) show:

Before*	After*
FUEL FIRED FURNACE	2-CHAMBER INDUCTION FURNACE
115°F.	98°F.

*Outdoor temperature 90°F.

The Chief Engineer says: "Working conditions for our operators have been greatly improved because of lower temperature in the immediate area of the furnace. Furnace shell is so cool that you can touch it with bare hands. We also find that molten metal is noticeably cleaner and, dross loss is considerably reduced."

Lindberg-Fisher Advantages:

COOLER OPERATION—Induction heating heats only the metal, not the entire furnace. No flame,—no products of combustion. Only comparatively small area of molten aluminum is exposed to operator.

CONTINUOUS LADLING—2-Chamber design allows cold metal to be added to charging chamber—does not affect temperature of ladling chamber within operating limits of the furnace.

ACCURATE TEMPERATURE CONTROL—Electronically controlled temperature equipment reduces scrap loss—allows lower maximum temperatures—eliminates over shooting and under shooting.

CLEANER MOLTEN METAL—Residue and impurities remain in charging chamber—only clean, residue-free metal passes to ladling chamber.

Ask for Bulletin 510 "Lindberg-Fisher 2-Chamber Induction Furnaces for Melting and Holding"

Fisher Furnaces

A DIVISION OF LINDBERG ENGINEERING CO.

2453 West Hubbard Street, Chicago 12, Illinois

UNITED STATES DUAL MOTOR VARI-SPEED SNAGGING GRINDER

INSURE PERFECT LOW-COST GRINDING IN YOUR FOUNDRY

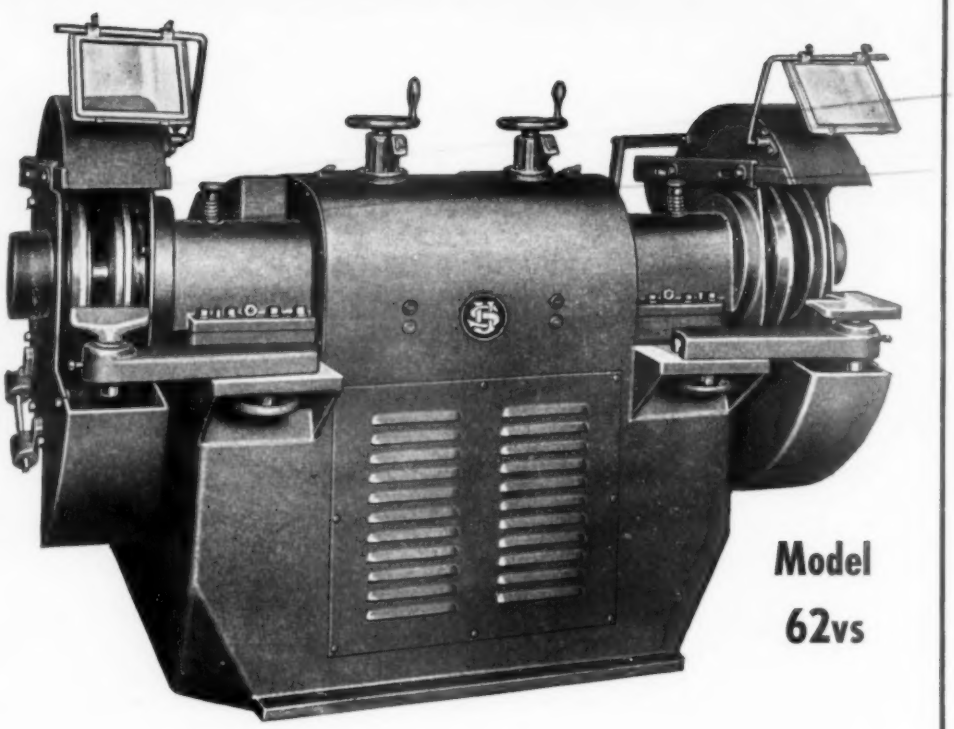
for

VITRIFIED

OR HIGH SPEED

WHEELS

Maximum peripheral speed can be maintained for the entire life of the wheels. WHEEL GUARDS ARE ADJUSTABLE TO WHEEL WEAR and are interlocked with speed changer. Motors are fan cooled, ball-bearing, totally enclosed. Push button stations on front of pedestal. Heavy chrome-manganese spindles operate in heavy duty ball bearings which are enclosed in dustproof housing with inner and outer oil seals.



Model 62vs

CONTACT YOUR JOBBER . . .

UNITED STATES ELECTRICAL TOOLS ARE CARRIED IN STOCK

America's most complete line of quality drills . . . bench and floor buffers . . . flexible shaft machines . . . bench, floor and portable grinders . . . bench, floor and portable polishers . . . .hole saws . . . sanders . . . screw drivers and many others.

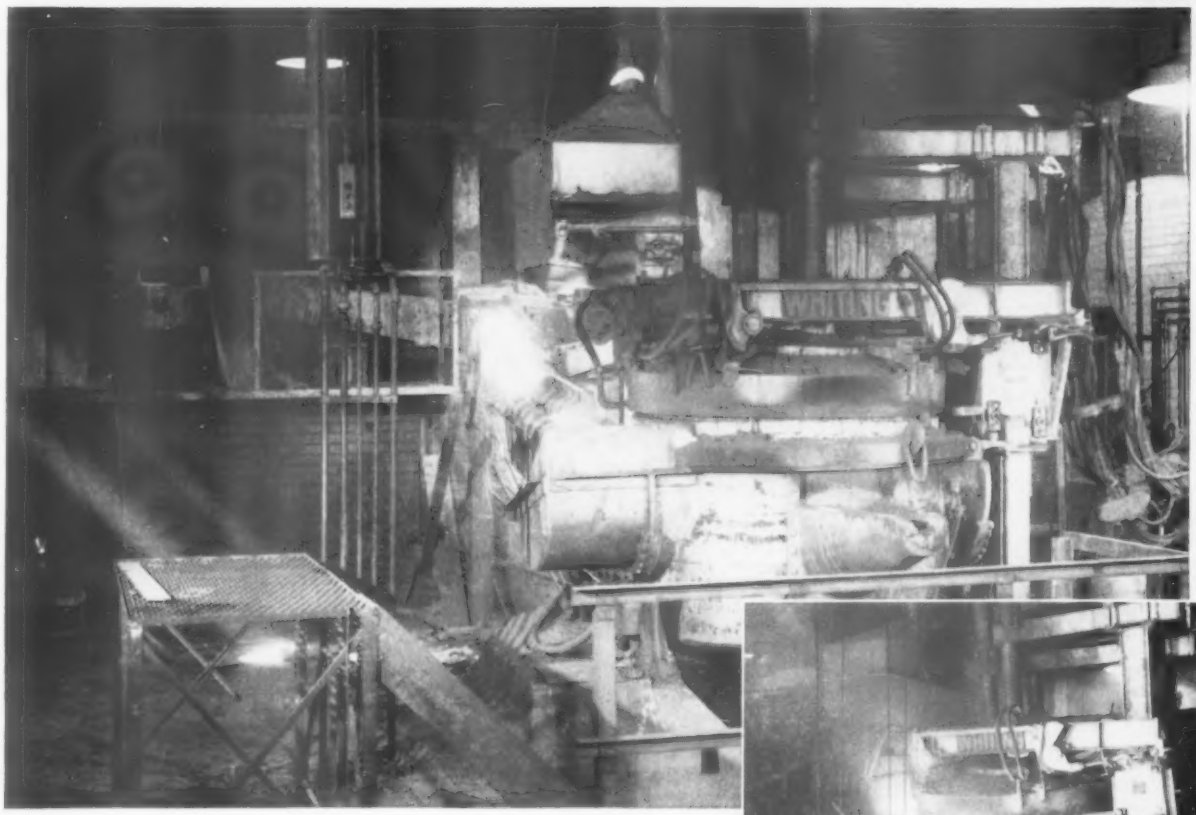
The UNITED STATES ELECTRICAL TOOL Co.

CINCINNATI, OHIO

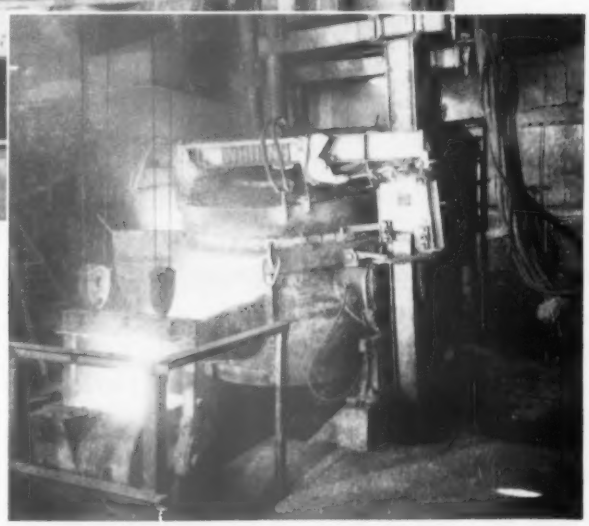
Cupola to Electric

MELTING WITH NEW CONVENIENCE

BETTER CASTINGS



Whiting Electric Furnace used for holding cupola metal. Note hot metal flowing continuously from the Whiting Cupola to the Whiting Hydro-Arc Furnace.



The same furnace with power on, pouring metallurgically adjusted, superheated metal into a ladle.

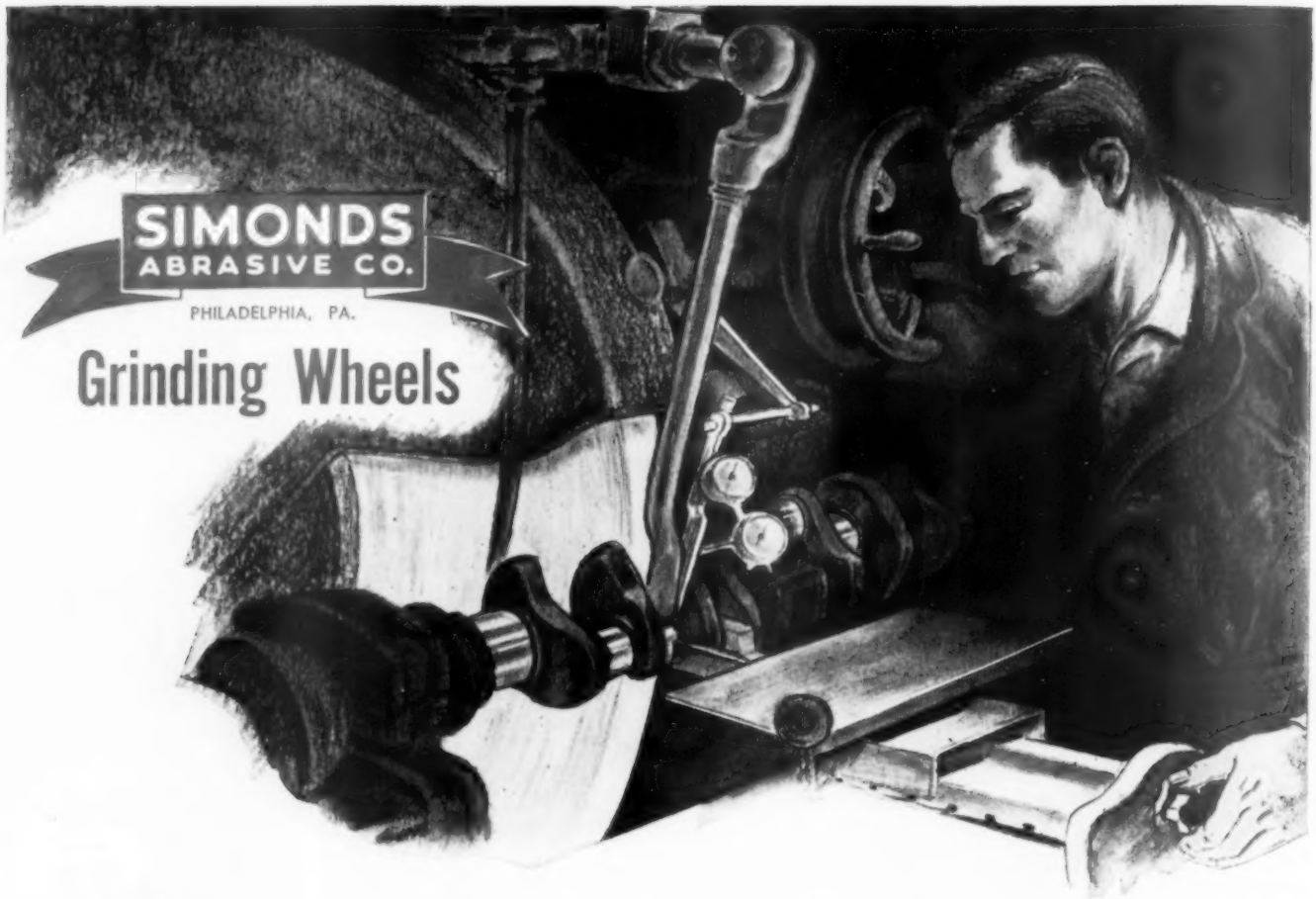
Whiting Hydro-Arc Furnaces have established new standards of convenience and economy in electric melting and heating. Floor-operated electrode clamps save workmen having to climb over the furnace to serve out electrodes that stay tight. Counter-balanced hydraulic electrode positioning equipment provides the kind of regulation required in this operation.

In some foundries, as in this one, Hydro-Arc Furnaces are used as holding furnaces to increase the temperature of cupola metal and provide facilities for metallurgical adjustments. Whiting engineers will gladly discuss with you this and many other foundry uses for Hydro-Arc Furnaces.

WHITING
CORPORATION

15607 Lathrop Ave., Harvey, Illinois

Offices in Chicago, Cincinnati, Detroit, Los Angeles, New York, Philadelphia, Pittsburgh, and St. Louis. Agents in other principal cities. Canadian Subsidiary: Whiting Corporation (Canada) Ltd., Toronto, Ontario. Export Department: 30 Church St., New York 7, N. Y.



How accurate is accurate?

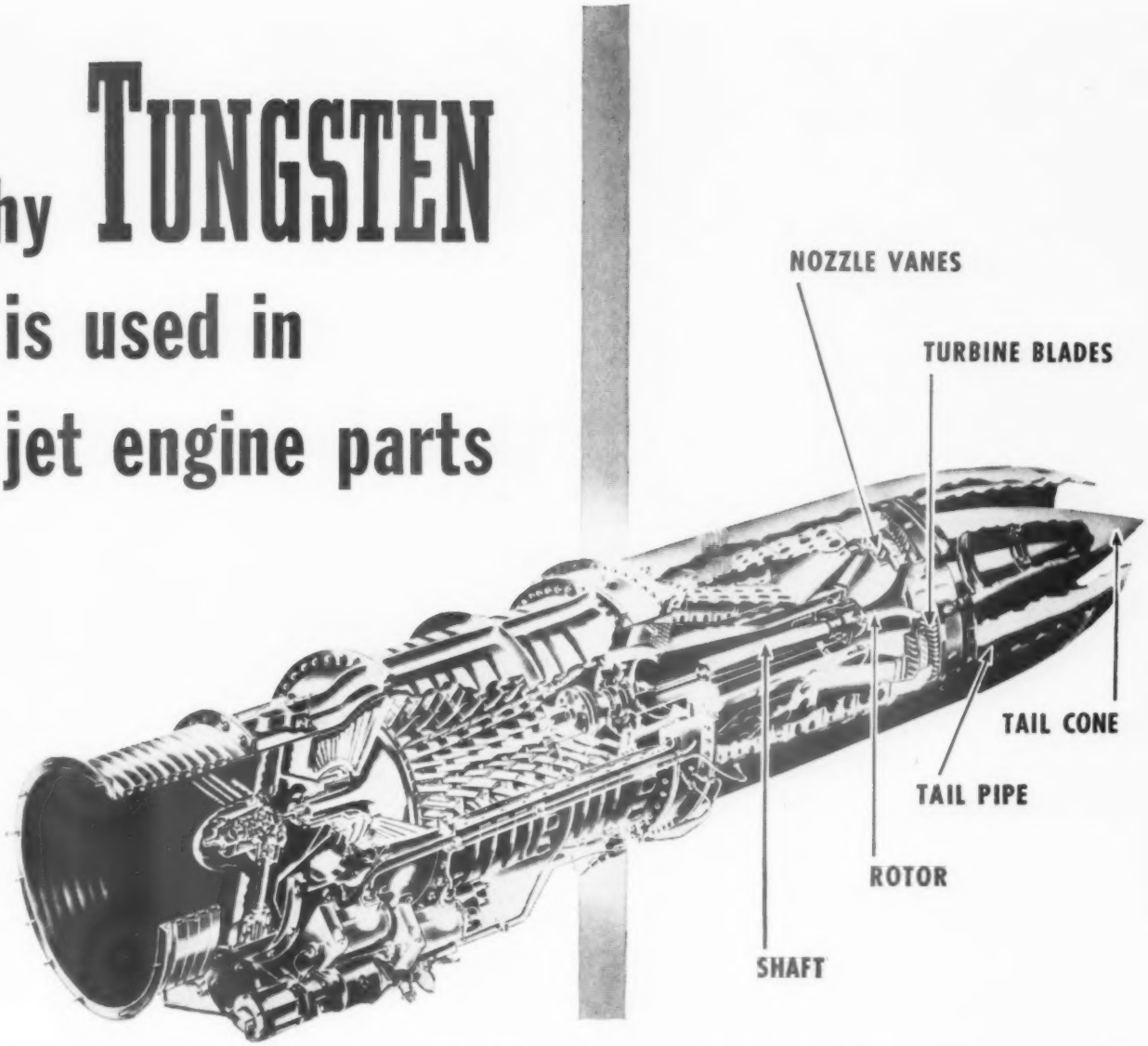
Here's one answer . . . 1/10,000 of an inch . . . a closely held tolerance common to production grinding. Here's another . . . 10 micro inches . . . a measurement of surface quality. Your cost man has still another . . . the dollar ratio between wheel cost and work ground.

Whether *you* measure accuracy in terms of production or maintenance grinding there's a Simonds Abrasive Company wheel, proper in grinding characteristics . . . accurate in specification . . . produced under complete, accurate quality control and rigidly tested to measure up to your job needs.

Write now for Data Book describing our complete line and listing your nearby Simonds Abrasive Company distributor.

SIMONDS ABRASIVE COMPANY, PHILADELPHIA 37, PA. DISTRIBUTORS IN PRINCIPAL CITIES

why TUNGSTEN is used in jet engine parts



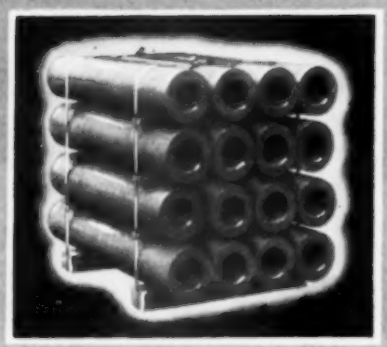
Small amounts of tungsten are used in the alloys for turbo-jet parts because tungsten increases their hardness and strength even at very high temperatures. The percentage of tungsten in high-temperature parts depends upon the physical properties desired and the service temperatures to be met. Tungsten-bearing alloys are produced in both cast and wrought forms.

For the manufacture of high-temperature alloys, ELECTROMET supplies a high-quality ferro tungsten conforming to A.S.T.M. Specification A144-39. This ferro-alloy contains 70 to 80 per cent tungsten and a maximum of 0.60 per cent carbon. It is available for immediate delivery in a crushed size of ¼ inch by down and is suitable for all electric furnace additions of tungsten in producing special heat-resistant alloys. Write for additional information on tungsten and other ELECTROMET alloys.

ELECTRO METALLURGICAL DIVISION
Union Carbide and Carbon Corporation
30 East 42nd Street UCC New York 17, N. Y.
OFFICES: Birmingham • Chicago • Cleveland • Detroit
New York • Pittsburgh • San Francisco
In Canada: Electro Metallurgical Company of Canada, Limited, Welland, Ontario

Electromet
TRADE-MARK
Ferro-Alloys and Metals

BOUND TO CUT ELECTRODE COSTS....



International graphite electrodes, sizes up to 20" x 72", are bundled on pallets, bound with steel straps for fast, easy handling by crane or fork lift. As a result, unloading time is cut, storage space is cut . . . your overall electrode costs diminish substantially.

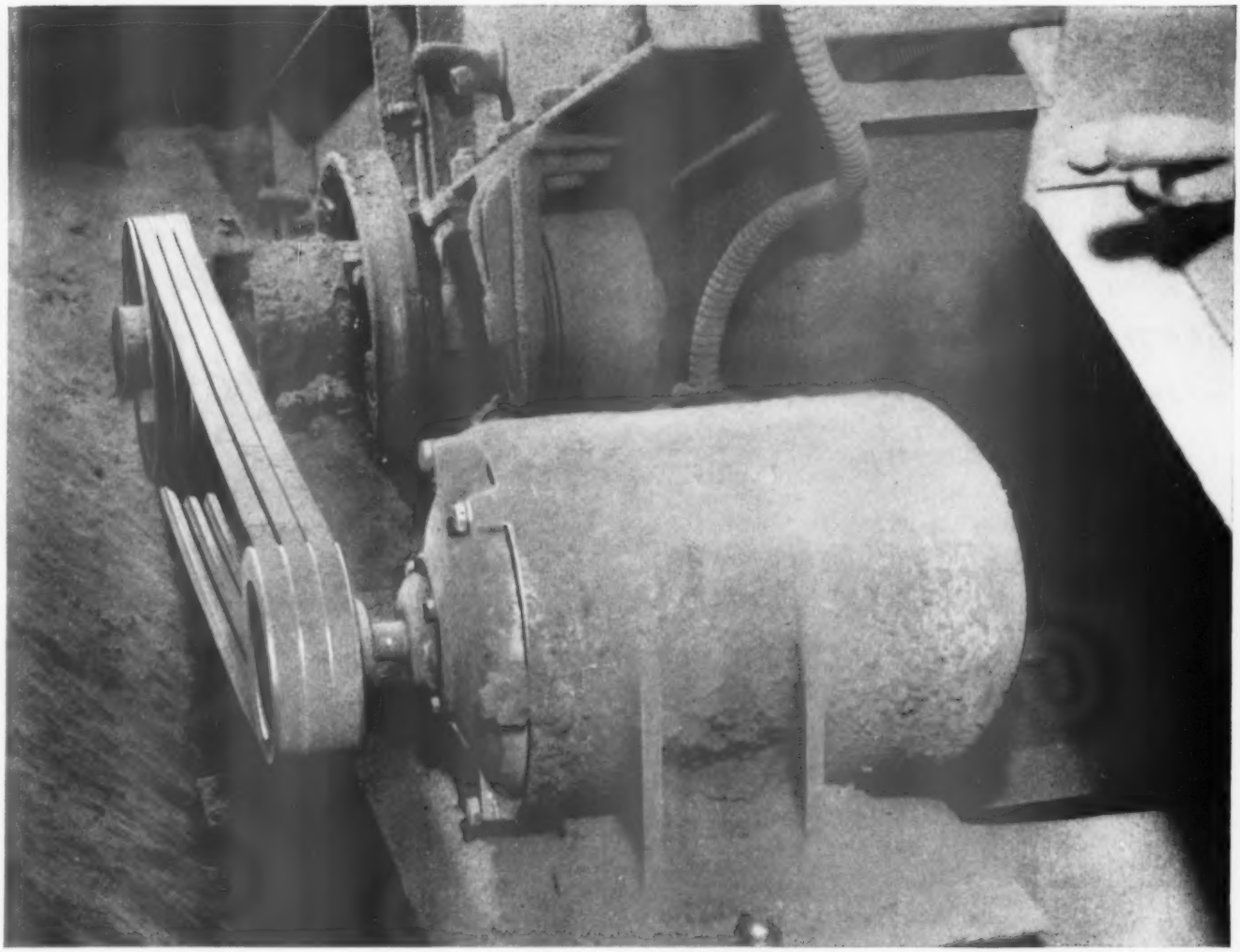
Palletizing electrodes is just one of many ways International helps cut your costs . . . one reason why you can profit by calling on International to supply your electrode requirements. Send for free booklet on graphite engineering data.

Graphite products for electrothermic and electrolytic applications

International GRAPHITE AND ELECTRODE CORP.

ST. MARYS, PA.

4763



Sandstorm Service Routine For A-C Totally-Enclosed Motor

HERE IS ONE of the toughest jobs assigned a motor in a foundry—driving an open screen in a sand conditioning system. Absolutely unprotected from storms of sand, this Allis-Chalmers totally-enclosed fan-cooled motor gives dependable service day and night in the Cicero, Illinois plant of National Malleable and Steel Castings Company.

Allis-Chalmers motors are standard in this well-known foundry because they are built to take the terrific punishment of foundry service. Double seal on shaft protects bearings and working parts against dust and dirt. Extra strong electrical parts stand up under stalling and adverse load conditions . . . continue to give dependable service.

Get the extra durability of Allis-Chalmers totally-enclosed motors for your foundry. Sold by expert application engineers through A-C Authorized Dealers and Sales Offices. Service guaranteed by A-C Certified Service Shops in all industrial areas.

Bulletin 6144 describes Allis-Chalmers totally-enclosed motors in detail. Write for your copy.

A-2746

ALLIS-CHALMERS, 1032A SO. 70 ST.
MILWAUKEE, WIS.

Foundromatic and *Regulex* are Allis-Chalmers trademarks.

ALLIS-CHALMERS

Foundry Equipment for Bigger Output-Better Working Conditions!

VIBRATING SCREENS · CUPOLA BLOWERS · FOUNDROMATIC SHAKEOUTS · FOUNDROMATIC CORE DRYER · INDUCTION HEATING & MELTING · REGULEX ARC FURNACE CONTROL

Powder-Cutting

Steps Up Production of Stainless Steel Castings 32 Times . . .

Riser cutting of centrifugally-cast stainless steel rings used to be a difficult and time-consuming job. In one foundry which used a boring machine, this operation took eight hours per casting. When powder-cutting was introduced, the time was reduced to approximately 15 minutes—a 32-fold increase in production.

In another foundry, powder-cutting was profitably used to remove $\frac{3}{8}$ to 1 in. of metal from stainless steel castings. The machining cost for this type of work has been $24.00 per casting. Substitution of powder-cutting brought the overall cost, including finish-grinding and chipping, to $7.53 per casting, and reduced the time from 8 hours to 1 hour. For an order of 60 castings, the foundry saved $988.20 and 360 hours of operating time.

If you have stainless steel or other oxidation-resistant metals to cut,

Centrifugally-cast rings of stainless steel are cut in 15 minutes time, increasing production 32 times.

LINDE's service engineers can show you how powder-cutting methods can be used with profit. Phone or write the nearest LINDE office.

Here, risers on stainless steel castings are being powder-cut—a time saving of 30 per cent over the former methods.

Linde
Trade-Mark

THE LINDE AIR PRODUCTS COMPANY

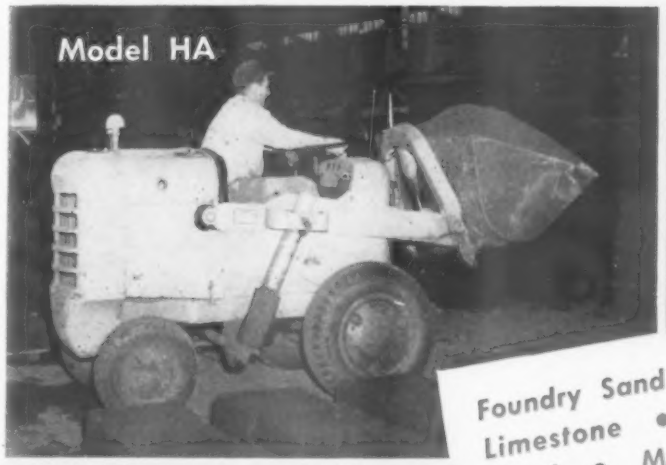
Unit of Union Carbide and Carbon Corporation

30 East 42nd St., New York 17, N. Y. UCC Offices in Other Principal Cities

In Canada: DOMINION OXYGEN COMPANY, LIMITED, Toronto

The word "Linde" is a registered trade-mark of The Linde Air Products Company

BULK MATERIALS HANDLING SIMPLIFIED



Foundry Sand • Coke
Limestone • Castings
Coal • Metal Scrap
Forgings • Cinders •
Barrels • Bales • Debris
• Snow.

HOUGH PAYLOADERS Designed to Handle Bulk Materials

Bulk materials of any kind can become bottlenecks in any plant. Are you equipped to scoop up, carry, lift and unload your mass materials quickly and cheaply? Do you require expensive containers for your ingredients, parts or bulk products in transit? How much do you handle with each operation?

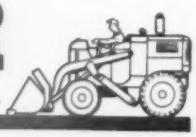
Hough PAYLOADERS are designed and built just for this purpose — to move the largest quantities of bulk materials in a single operation—to operate in congested areas — with simplicity and speed. Scoop up your loose materials in PAYLOADER's even-keel bucket, move them without spilling in and out of box cars, through narrow aisle ways, and through mud and soft ground if you wish. Load your materials into any hopper, container or bin — high or low — by means of its dust and noise reducing dumping mechanism. PAYLOADER's hydraulically controlled dump release has numerous industrial advantages.

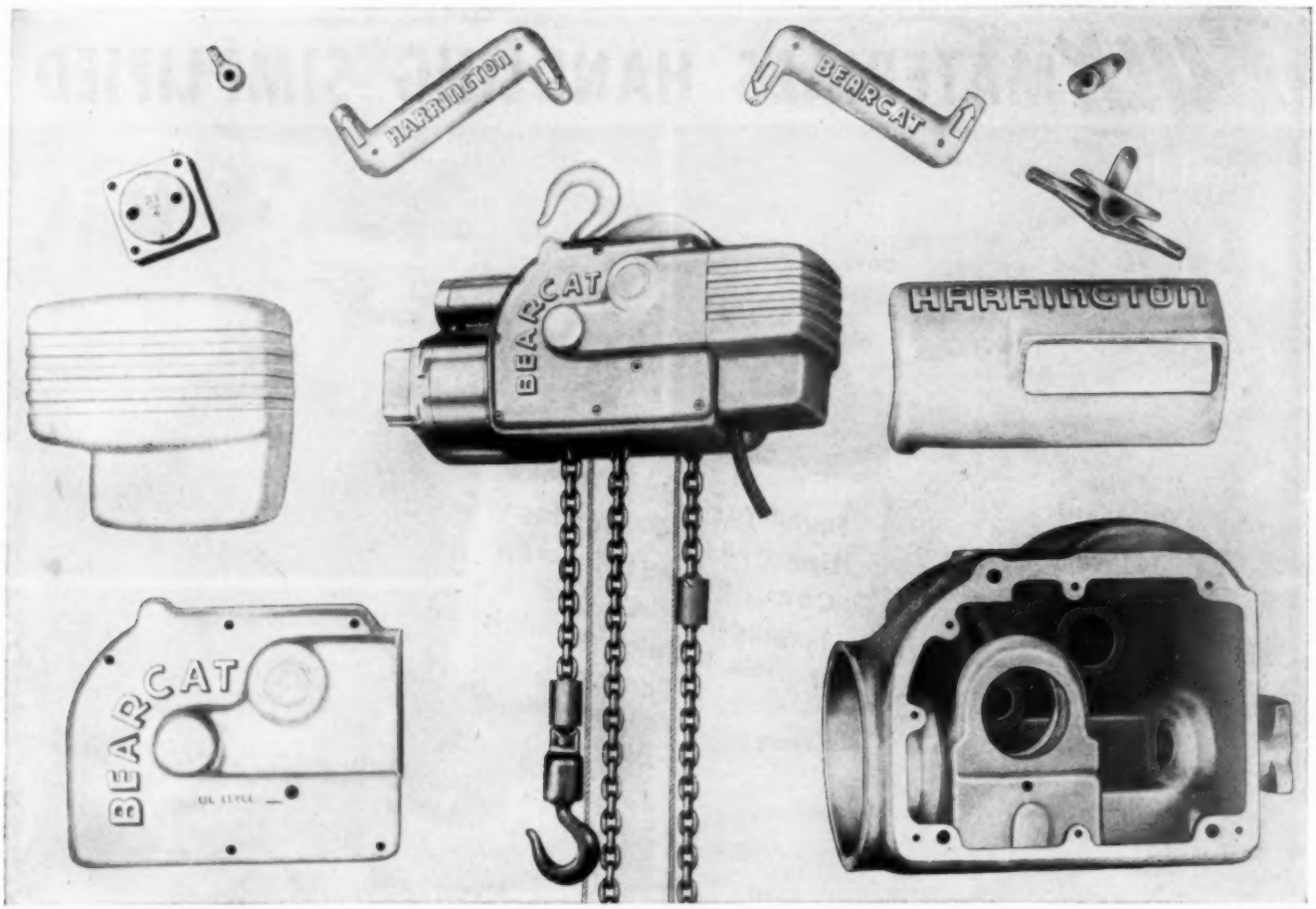
The same PAYLOADER unit which will really solve your major bulk material handling problems will likewise be an overtime workhorse for plowing and loading snow, cleaning yards, levelling waste dumps and grading. PAYLOADERS are dependable — because they are the result of materials handling experience since 1920. The Frank G. Hough Co., 703 Sunnyside Avenue, Libertyville, Illinois.

SEND FOR FREE LITERATURE on any of the four sizes of PAYLOADERS: the 10½ cu. ft. Model HA, the ¾ yd. Model HF, the 1¼ yd. Model HL or the 1½ yd. Model HM — also the 2 yd. Payloader Buggy

SAY HUFF

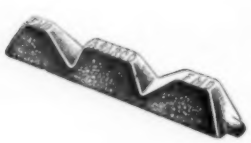
HOUGH
PAYLOADER
Mfg'd. by THE FRANK G. HOUGH CO.





JML Co. P80

Cut Weight, Eliminate Heat Treatment, Improve Properties — with TENZALOY



Casting ten parts of the Bearcat electric hoist (above) in TENZALOY enabled the manufacturer, The Harrington Company, Philadelphia, to:

1. Produce the article without heat treatment, thus saving an added expense.
2. Reduce castings' weight from an average of about 60 lbs. (original ferrous metal design) to 20 lbs., thus improving portability.
3. Cut machining and handling costs.
4. Improve appearance and corrosion properties, thus increasing sales appeal.
5. Virtually eliminate rejects.

The Fisher Casting Company, North Plainfield, N.J., which cast the components shown above, is a longtime user of TENZALOY. Its competent staff knows well this aluminum-magnesium-zinc alloy which Federated developed to give high strength without heat treatment. Therefore, when they recommended TENZALOY, and worked with Harrington and Federated engineers on the project, they were certain of its eventual success.

This happy and profitable experience can be yours, too. Write Federated's Dept. CW for technical pamphlet on TENZALOY.

Federated first in the non ferrous field AMD

Federated METALS DIVISION

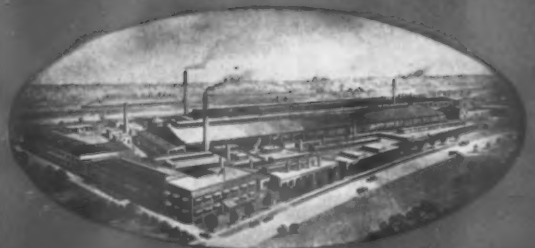
AMERICAN SMELTING AND REFINING COMPANY, 120 BROADWAY, NEW YORK 5, N.Y.

Use

FANNER CHAPLETS and CHILLS

for

BETTER CASTINGS



Birdseye view of the Fanner Brookside Park Plant in Cleveland

. . . because Fanner Chaplets and Chills are precision-made.

. . . because Fanner Chaplets and Chills offer you the widest variety of selection—

. . . because the Fanner line includes as "standards" many Chaplets and Chills priced elsewhere as "specials".

Write our Engineering Department for recommendations without obligation.

THE FANNER MFG. CO., CLEVELAND 1, OHIO

In Canada: CANADIAN FANNER, LTD., Hamilton, Ont., Canada

Smith L-O Core Oil

A SOUND INVESTMENT IN ESSENTIAL SUPPLIES

You'll find Smith L-O Core Oil a high-quality binder; unparalleled from the standpoint of uniformity . . . superior in binding strength, faster baking, workability.

Recommended for use with ferrous or non-ferrous metals, Smith L-O is used in leading gray iron, steel, aluminum, and magnesium foundries doing production and jobbing work on many classses of castings both heavy and light.

Take advantage of the many features which make this core oil a sound investment in essential supplies. Get Smith L-O Core Oil . . . Dow-Therm* processed for homogeniety — in 20 grades to suit your particular conditions.

** The only core oil processed by this method of heat treatment.*

Smith L-O *Core Oil*

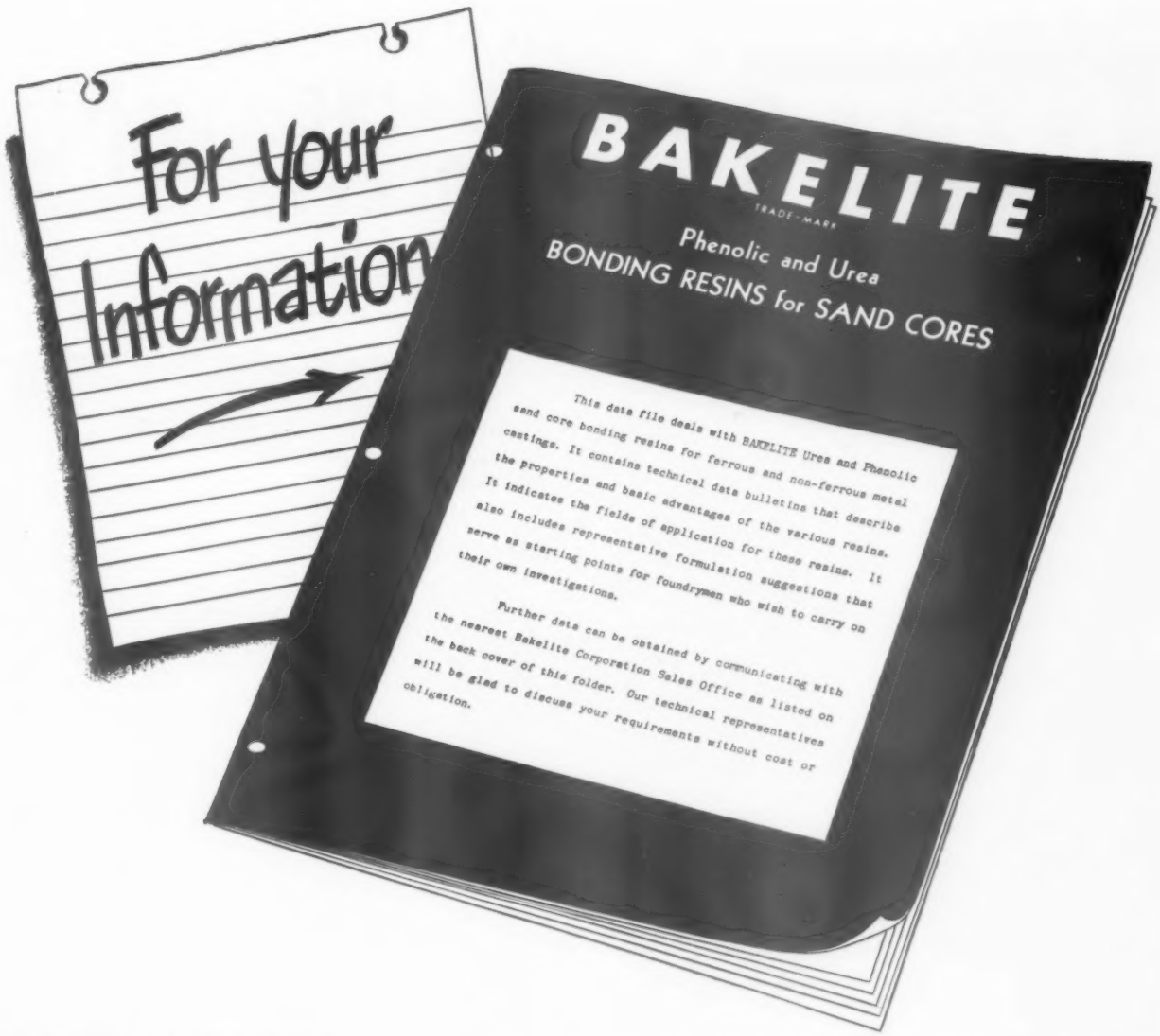
WAREHOUSE STOCKS AVAILABLE
In The Following Cities

- COLUMBIAN WAREHOUSE CO. — Reading, Pennsylvania
- FOUNDRY SERVICE CO. — Birmingham, Alabama
- E. R. FROST CO. — Minneapolis, Minnesota
- MARKET TERMINAL WAREHOUSE — Buffalo 4, New York
- MALCOLM G. STEVENS — Arlington, Massachusetts
- TERMINAL WAREHOUSE — Worcester 8, Massachusetts
- TOMKINS TIDEWATER TERMINAL — South Kearny, New Jersey
- M. W. WARREN COKE CO. — St. Louis, Missouri
- WESTERN FOUNDRY SAND CO. — Seattle, Washington
- WESTERN INDUSTRIAL SUPPLY CO. — Portland 14, Oregon

Smith L-O *Core Oil*

CORE WASH ROD DIP LIQUID PARTING

SMITH OIL & REFINING CO.
INDUSTRIAL OILS DIVISION . . . ROCKFORD, ILLINOIS


For your Information
BAKELITE
TRADE-MARK
Phenolic and Urea
BONDING RESINS for SAND CORES
This data file deals with BAKELITE Urea and Phenolic sand core bonding resins for ferrous and non-ferrous metal castings. It contains technical data bulletins that describe the properties and basic advantages of the various resins. It indicates the fields of application for these resins. It also includes representative formulation suggestions that serve as starting points for foundrymen who wish to carry on their own investigations.
Further data can be obtained by communicating with the nearest Bakelite Corporation Sales Office as listed on the back cover of this folder. Our technical representatives will be glad to discuss your requirements without cost or obligation.

BAKELITE DATA FILE Shows How Resin Binders for Sand Cores Increase Output—Boost Quality—and Cut Costs

This new Data File points the way to major production economies in present foundry practices. It includes technical bulletins on several BAKELITE bonding resins for sand cores . . . providing data on properties of resins, and suggestions and procedures for typical core mixes.

Actual foundry practice *proves* all these benefits from using BAKELITE Phenolic and Urea Resins in sand core bonding:

- ***Shorter* baking cycles . . . half the time, or less, than required for non-resin bonding materials. Or, with high-frequency heating, complete baking takes MINUTES, instead of hours.**
- **Smoother surface finish, lower cleaning costs on castings.**
- **Minimizes core rejects.**
- **Minimum moisture pick-up, permitting longer storage of cores.**
- **Less binder needed for desired core strength.**
- **Better collapsibility of cores.**

Write for your copy of the BAKELITE Bonding Resins Data File now. Or use the handy coupon.

Bakelite
TRADE-MARK
Phenolic and Urea
CORE BONDING RESINS

BAKELITE CORPORATION

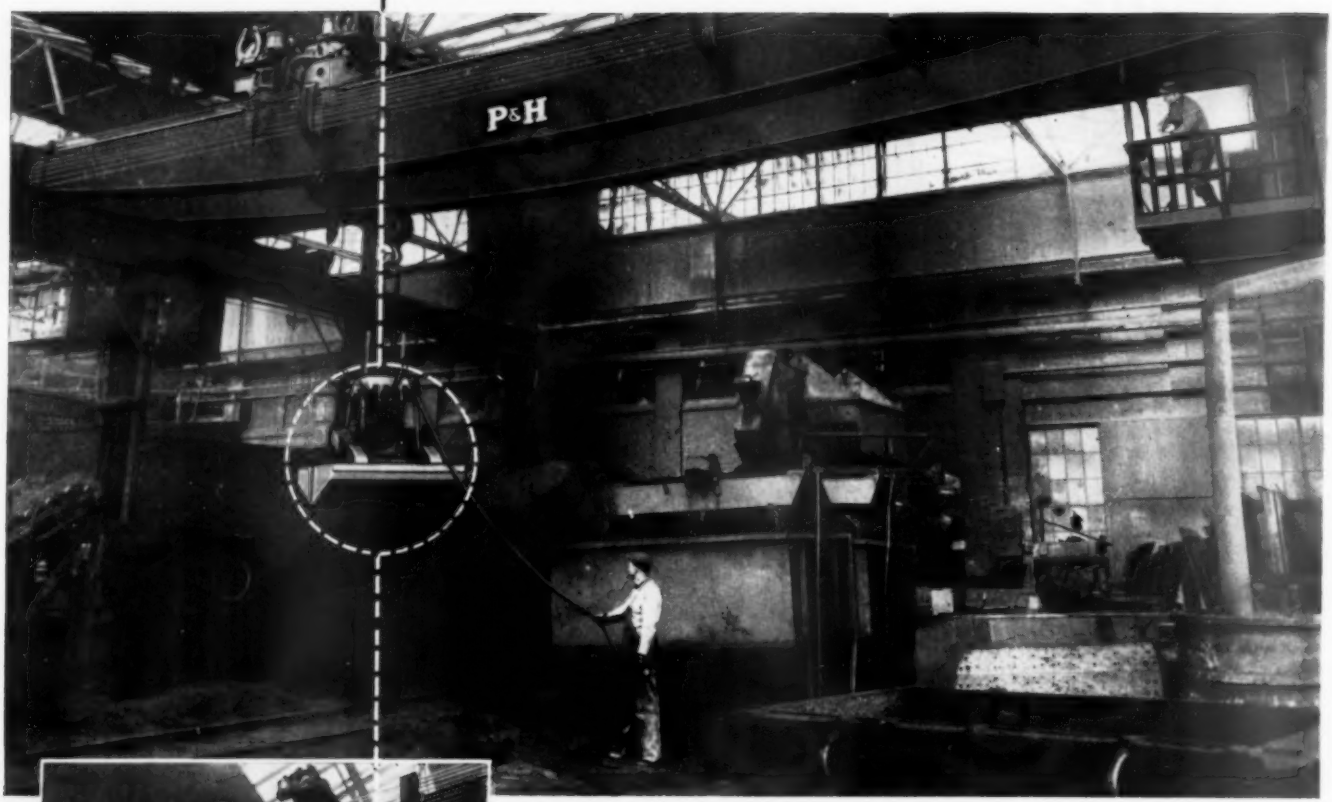
BAKELITE CORPORATION
Unit of Union Carbide and Carbon Corporation UCC
30 East 42nd Street, New York 17, N.Y.

BAKELITE CORPORATION, Dept. R-29
30 East 42nd Street, New York 17, N.Y.

☐ We would like to talk to your representative.
☐ We would like to obtain samples.
We are primarily interested in casting ☐ iron ☐ steel ☐ brass ☐ bronze ☐ aluminum ☐ magnesium ☐ other.
☐ We wish The Technical Data File giving economic advantages and formulation suggestions.

*Name*_____ *Title*_____
*Company*_____
*Street*_____ *City*_____ *State*_____

P&H SINGLE LINE GRAB BUCKETS



a "*Natural*" in foundry service!

In a matter of seconds you can attach the P&H Single Line Grab Bucket to your crane hook and it's ready to go to work. It's as simple as that — and it provides easy, accurate one-man operation. It works fast, bites deep, picks up clean.

Here's the fast, easy way to handle all kinds of bulk materials — sand, coke, crushed stone, cinders, etc. It's widely used to unload cars, dig pits, fill flasks, etc. A "natural" for foundry use if there ever was one.

Available in capacities from ½ to 2½ yds. Write for all the facts about it. Ask for Bulletin C-27.

P&H

GRAB BUCKETS
4405 West National Avenue
Milwaukee 14, Wis.

HARNISCHFEGER CORPORATION
ELECTRIC CRANES · EXCAVATORS · ARC WELDERS · P&H · HOISTS · WELDING ELECTRODES · MOTORS

It's Expensive to Heat "ALL OUTDOORS"

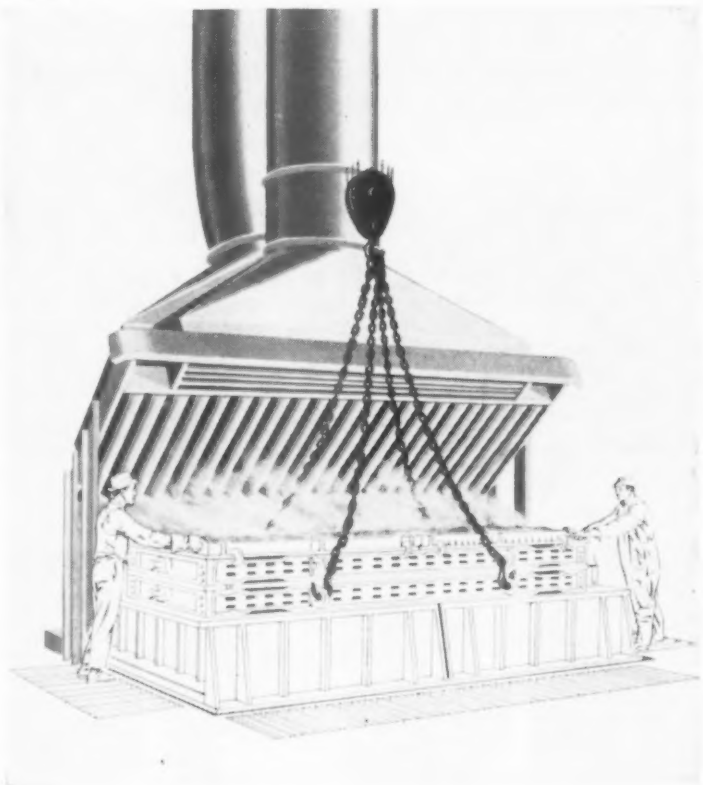
SCHNEIBLE *"Compensating Air"* HOODS

Save Your Building Heat in Winter!

Though the weather may be hot, now is the logical time to think about next winter's plant efficiency. Those antiquated shakeout hoods may be dissipating extra profits right out of the stacks.

Schneible "Compensating Air" Hoods were designed especially for removal of contaminated air without the usual waste of usable warm air that costs money to produce.

The "Compensating Air" supply, taken from outside the plant prevents "robbing" plant of warm air in severe weather—thus reducing heating costs and preventing undesirable airflow patterns throughout the foundry.



All contaminated air is efficiently conducted to the Schneible Multi-Wash Dust Collector with heavier particles going to the Schneible Velocitrap and then to the shakeout sand conveyor belt.

Put Schneible on your list of "musts" when considering efficient dust and fume control.

ENGINEERING REPRESENTATIVES IN PRINCIPAL CITIES

CHECK your present HOODS for these features!

- Outside air to work stations in winter months.
- Air from high inside during the summer.
- Airflow pattern confined to working stations.
- Directional air control over shakeout only.
- Maximum usable floor area retained.
- Low maintenance and operating costs.

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT

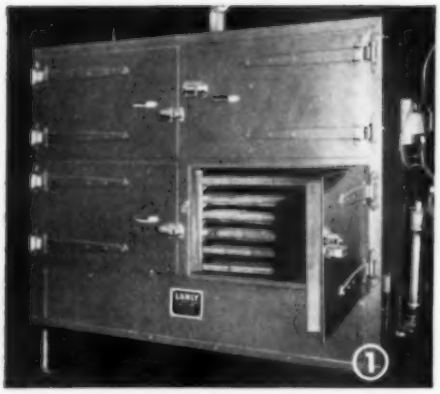
U.S. and Foreign Patents Applied For

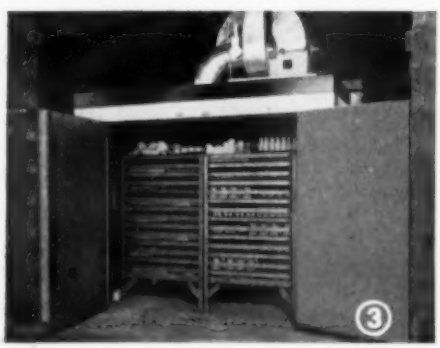
For further information, write for Bulletin Number 548.

CLAUDE B. SCHNEIBLE COMPANY
2827 Twenty-Fifth Street • Detroit 16, Michigan

SCHNEIBLE

MULTI-WASH COLLECTORS, VELOCITRAPS, WEARPROOF PUMPS, DEWATERING AND SETTLING TANKS, ENTRAINMENT SEPARATORS.





Foundry Ovens

for ALL FOUNDRY REQUIREMENTS

Whether your particular requirements concern core baking, pasting and mold drying, or ovens and air draw furnaces for casting conditioning and heat treating, the LANLY organization of experts is well qualified to serve you.

If a LANLY standard unit does not fit into your picture, we'll design and build one that will.

LANLY efficient convection type air heaters and balanced re-circulating systems are but two of the advanced design features which have attributed strongly to the ever growing acceptance of LANLY as an established authority in the field of foundry ovens.

Write for the Catalog containing a list of purchasers and an illustrated description of the entire list.

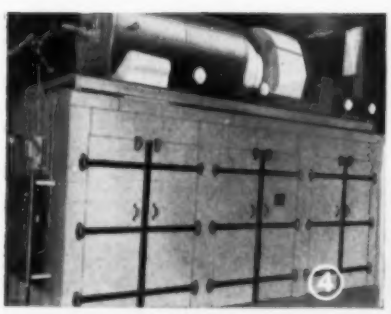
FIG. 1 — A Lanly Shelf Type Core Oven. This unit is heated by means of burners located directly under the work chamber. Available in several standard sizes.

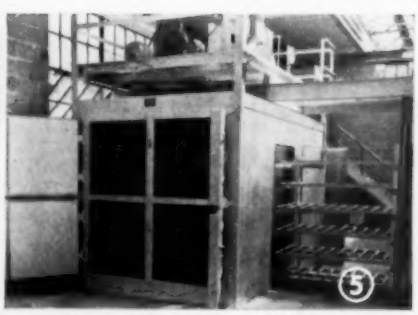
FIG. 2 — A Two Compartment Car Type Mold Drying Oven. Each compartment individually heated and controlled.

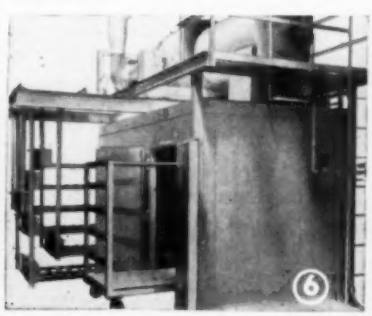
FIG. 3 — A Rack Type Oven which accommodates two racks side by side with a single set of doors. Installed where space limitations do not permit separate openings for each rack.

FIG. 4 — Three Compartment Rack Type Oven is equipped with combination oil gas burner equipment. The change from oil to gas or vice versa can be made in a few minutes.

FIGS. 5 & 6 — A Combination Shelf. Drawer and Truck Type Oven. Heat is furnished by one efficient Lanly forced convection system.







Write for Bulletins on LANLY Finishing, Cabinet Type and Heat Treating Ovens

THE LANLY CO.

OVENS FOR INDUSTRY

HEATED BY GAS, OIL, ELECTRICITY OR STEAM

Pays for itself in *5 months*

When the Rotor Application Engineer called on this manufacturer of materials handling equipment, he found the shop using universal electric grinders for grinding welds. He pointed out the possibilities for cutting costs with Rotor Air Grinders and demonstrated them with these results:

Cuts grinding time in half due to greater cutting power . . . higher speed under load.

Savings pay for tools in 5 months due to reduced man-hours for grinding. An annual return of 240% on investment.

Improves working conditions because Rotor air tools are lighter in weight and run cool even on hot summer days.

Would you like similar benefits? Just call the Rotor Application Engineer.

AIR O'TOOL

Beat

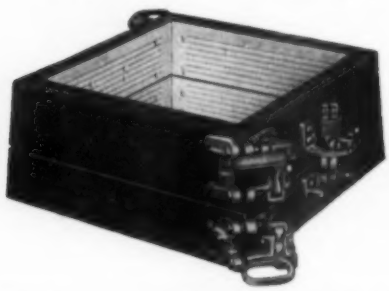
Lagging Production—

Rising Costs

Adams 12"-38"
Jolt Squeezer
Portable Type

ADAMS MOLDING EQUIPMENT

You'll get more and better molds, faster and at less cost when you use Adams Molding Equipment. There is a complete range of Adams high quality custom-built flask equipment, designed to give longer life and better service. Adams Molding Machines give you uniformly perfect molds, high production at lower cost per man hour. They are made in a variety of sizes and styles to meet virtually every requirement. Adams experienced foundry engineers will gladly supply complete details. Write for Catalog 705.



THE ADAMS COMPANY
700 FOSTER ST., DUBUQUE, IOWA

The ADAMS Company

ESTABLISHED 1883

DUBUQUE, IOWA, U.S.A.

MOLDING MACHINES and FLASK EQUIPMENT

New

General Electric's LIQUID RESIN CORE BINDER

IT CAN BRING YOU...

REDUCED BAKING TIMES
G-E 12300 cures rapidly, requiring about half the baking time of conventional oil binders.

FEWER CASTING REJECTS
Sand cores made with G-E 12300 have exceptionally good permeability and also have a lower gas evolution during casting than oil-bound cores, thus resulting in fewer blowholes.

LOWER CLEANING COSTS
G-E 12300 gives cores excellent resistance to metal penetration and sand burn-in, thereby giving castings a smoother surface finish than is obtained with oil binders.

LESS BREAKAGE OF CASTINGS
Because cores bound with G-E 12300 have better collapsibility and quicker shakeout than comparable oil-bound cores, the danger of breaking malleable or light metal castings is reduced.

● General Electric's No. 12300 phenolic liquid resin core binder has been thoroughly tested and is now being used with outstanding success by iron and steel foundries throughout the country.

Economical and easy to handle, G-E 12300 has good pasting characteristics and is readily adaptable to automatic core blowing machines.

Samples and technical information will be furnished on request. Our sales engineers will be happy to assist you in adapting G-E 12300 to your core production techniques.

Why not find out more about this NEW BINDER? Fill out the coupon and mail TODAY.

Chemical Dept., Section 44-7
General Electric Co.
Pittsfield, Mass.

☐ Send technical data.
☐ Send a sample of G-E 12300.
☐ Have your representative call.

Name _____
Company _____
Street _____
City _____ State _____

You can put your confidence in—

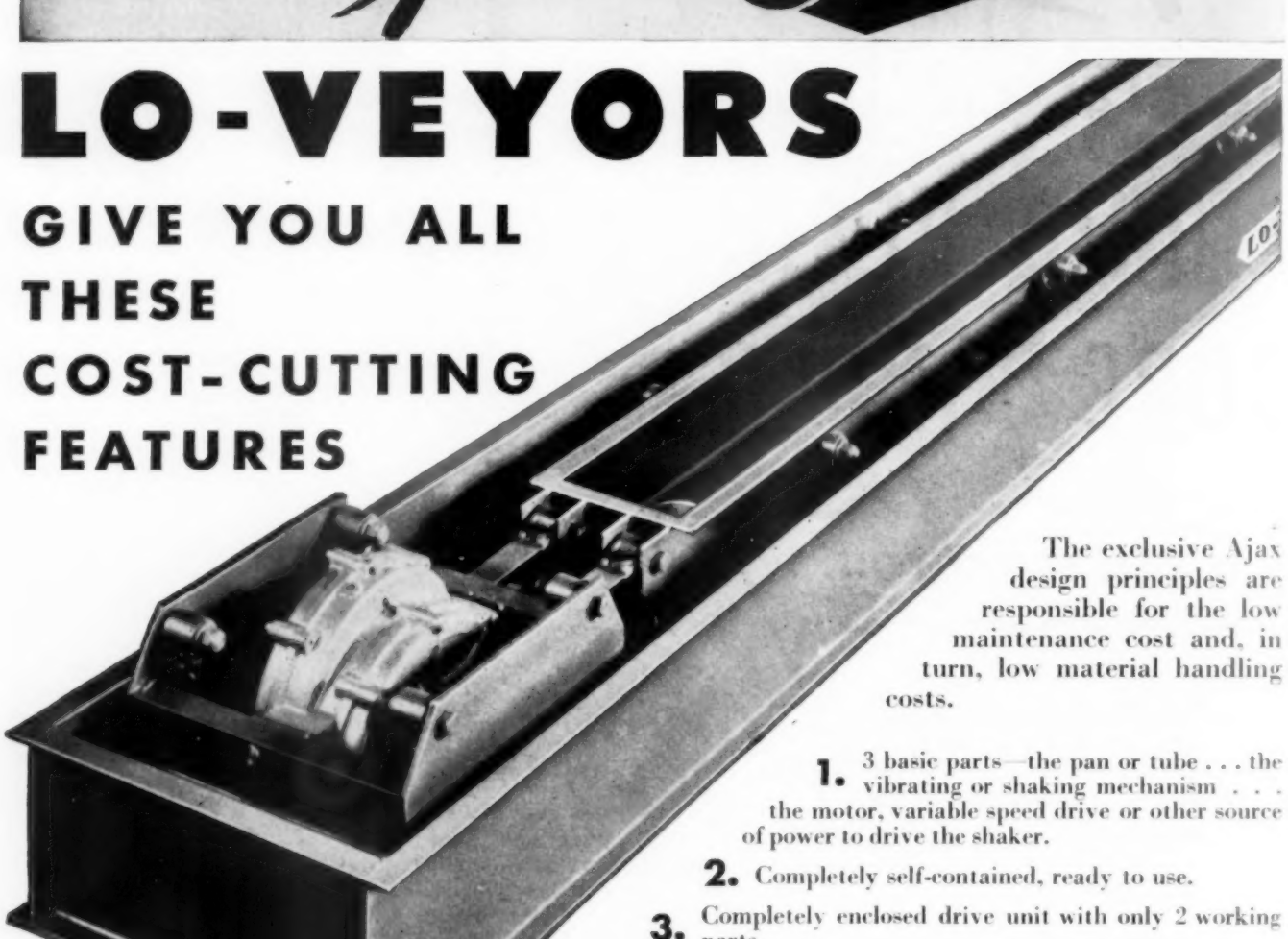
GENERAL ELECTRIC

CD19-V1

Only AJAX

LO-VEYORS

GIVE YOU ALL THESE COST-CUTTING FEATURES



The exclusive Ajax design principles are responsible for the low maintenance cost and, in turn, low material handling costs.

1. 3 basic parts—the pan or tube . . . the vibrating or shaking mechanism . . . the motor, variable speed drive or other source of power to drive the shaker.
2. Completely self-contained, ready to use.
3. Completely enclosed drive unit with only 2 working parts.
4. Conveyor pan supported by flat springs mounted in rubber bushings,—no exposed bearings, no eccentric shafts, idler and tail pulleys.
5. Pan or tube can be made of ferrous or non-ferrous metal and can be lined or coated for protection against contamination.
6. Pans available with or without covers.
7. Tubular conveyors provide gas-tight construction for critical process and explosive operations.

Write giving outline and sketch of your requirements for handling dry aggregates.

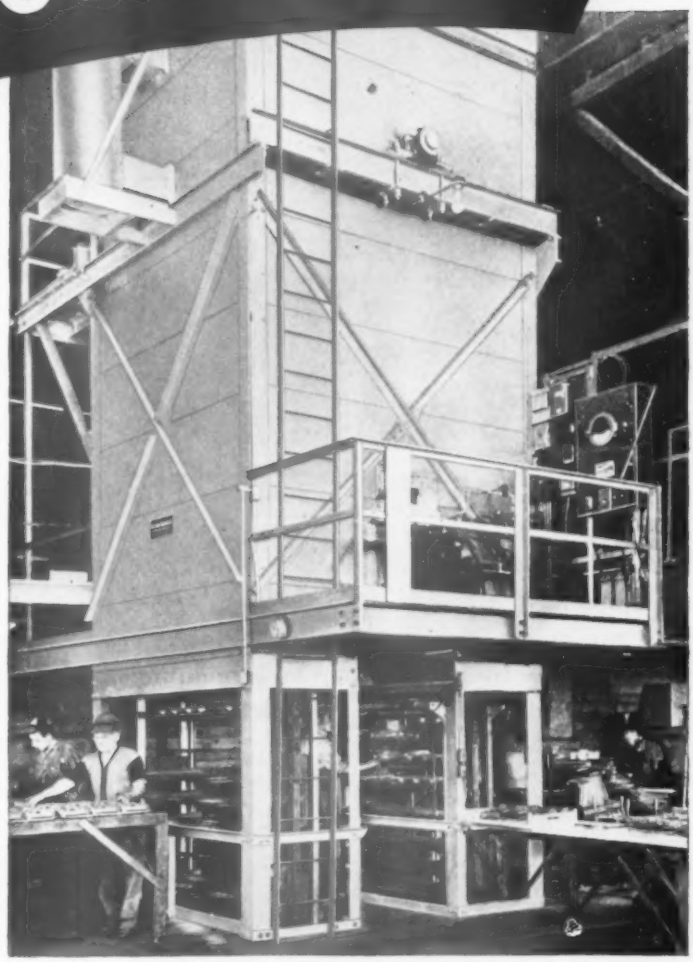
AJAX FLEXIBLE COUPLING CO. INC.

CONVEYOR AND SCREEN DIVISION • WESTFIELD, N. Y.

CUT COREROOM COSTS and IMPROVE PRODUCTION

with

COLEMAN TOWER Ovens*



COLEMAN TOWER CORE OVEN
at Barnes Manufacturing Company, Mansfield, Ohio

Coleman Tower Ovens cut coreroom costs and improve production in at least 4 different ways:

1. **PATENTED OPEN CENTER:** Provides close, efficient grouping of coremakers around the oven. The exclusive 3-way loading feature increases accessibility 300% over ordinary vertical oven designs. Cuts carry time... increases productivity.
2. **AMAZING FLOOR SAVING:** The elimination of racks, aisleways, and large working space required by batch ovens permits savings up to 75% in floor area. Less space...greater output.
3. **RECUPERATIVE COOLING SYSTEM:** Cores are "smoked off" and cooled before they reach the unloading station, making for better working conditions. The heat recovered from the cores is used over again, resulting in large fuel savings.
4. **PERFECT BAKING:** Eliminates rejects and make-overs. Coleman Heating Systems for gas, oil, stoker-coal or electricity; whichever fuel is most economical in your locality.

Over 10,000 installations of Coleman Ovens are proving their extraordinary money-making ability in every type of foundry in the United States today. It will pay you to investigate today.

* Trade Mark Reg. U. S. Pat. Off.

Write today for Bulletin 48.

A FEW REPRESENTATIVE COLEMAN TOWER OVEN OWNERS

Ferro Machine and Foundry, Inc.
Cincinnati Milling Machine Co.
Lakey Foundry & Mach. Co., Inc.
Natl. Mall. & Steel Castings Co.
International Harvester Co.
Oberdorfer Foundries, Inc.
General Motors Corp.
Minneapolis Moline Co.
Cleveland Foundry Div.
Lynchburg Foundry Co.
Singer Manufacturing Co.
Walworth Co.

COLEMAN OVENS ARE AVAILABLE IN A WIDE RANGE OF SIZES AND CAPACITIES FOR VARIOUS PRODUCTION NEEDS, ASSURING DEPENDABLE PERFORMANCE AT LOWEST POSSIBLE COST

THE FOUNDRY EQUIPMENT COMPANY

1831 COLUMBUS ROAD **CLEVELAND 13, OHIO**

World's Oldest and Largest Foundry Oven Specialists • Over 10,000 Successful Installations

MEMBER MANUFACTURERS ASSOCIATION INC. FOUNDRY EQUIPMENT

NEW . . . AO R2000 RESPIRATOR

WITH 7 TYPES OF CARTRIDGES and FILTER!

"Twist of the Wrist" Interchanging of all Cartridges, Filters, Accessories

AO presents the R2000 Respirator with a new type of retainer shell that accommodates 7 types of quickly INTERCHANGEABLE cartridges — THREE FOR PROTECTION AGAINST DUSTS — FOUR FOR GASES AND VAPORS — plus a DISK TYPE, CHEMICALLY TREATED DUST FILTER — eight respirators in one. Thus, for the first time, an overall dust respirator of the chemically treated, replaceable filter type provides secure protection against both specific dusts and specific gas and vapor hazards merely by interchanging the cartridges. Four new all metal chemical cartridges of NON-SPARKING, seamless aluminum protect against fire hazards, weigh less than previous types and have increased fill for added adsorptive capacity. Deterioration caused by moisture and rough handling is retarded.

APPLICATIONS & ADAPTATIONS

R2000

Compact, five inch chemically treated "throw away" R25 filter has the efficiency of previous filters eight times its size. Protects against both poisonous and disease-producing dusts and against a *combination of all dusts* — toxic, nuisance and pneumoconiosis-producing. Gauze pre-filter adds to filter life by blocking entry of larger particles. Approved by Bureau of Mines, No. 2154.

R2031 — (R31 Cartridge)
For low concentrations of light organic fumes, vapors and gases generated in paint spraying, degreasing, dry cleaning, cementing, etc. Adsorbs benzene, xylene, toluene, gasoline, acetone, turpentine, etc.

R2032 — (R32 Cartridge)
For low concentrations of acid gases, fumes and mists such as sulphuric acid, hydrogen chloride, nitric acid. Protects against fumes from plating and pickling tanks, etc.

R2033 — (R33 Cartridge)
For low concentrations of combined acid and organic gases such as halogenated hydrocarbons and trichlorethylene; carbon tetrachloride, acetic acid. Protects against gases, fumes and vapors in degreasing operations, etc.

R2034 — (R34 Cartridge)
For nuisance concentrations of ammonia only.

R2015 — (R15 Cartridge)
For nuisance and pneumoconiosis-producing dusts in mining, quarrying, tunneling (quartz, sand, asbestos, coal, marble). *Not* to be used against vapors, gases or toxic dusts. Bureau of Mines Approval No. 2121.

R2016 — (R16 Cartridge)
For toxic dusts caused by grinding and crushing lead, cadmium, arsenic, chromium, manganese, selenium, vanadium. *Not* to be used against gases or vapors of above material. Bureau of Mines Approval No. 2138.

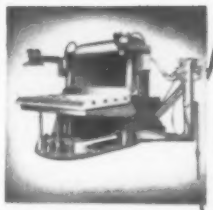
R2017 — (R17 Cartridge)
For a combination of all dusts, including toxic, pneumoconiosis-producing and nuisance dusts. *Not* to be used against gases or vapors. Bureau of Mines Approval No. 2138.

Order from your nearest AO Safety Products Representative and consult him about the protection to meet your needs.

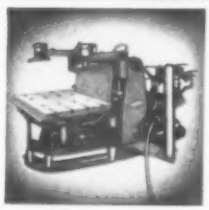
American Optical
COMPANY
Safety Products Division

Southbridge, Massachusetts • Branches in Principal Cities

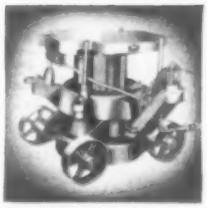
ARE YOU BEING HELD UP?



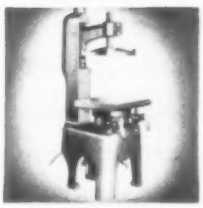
Jolt Rollover Draw, Model A



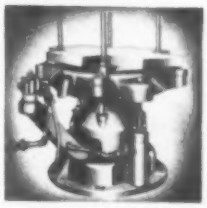
Jolt Rollover Draw, Model SA



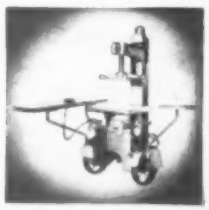
Jolt Pin Lift, Model AJS (portable)



Jolt Squeeze, Model 10-JX (stationary)



Jolt Pin Lift, Model AJS (stationary)



Jolt Squeeze, Model 10-JX (portable)

ARE YOU BEING HELD UP?

Hand operated and old or obsolete equipment increase your costs and rob you of profits.

You wouldn't go down a dark alley filled with lurking thugs. You wouldn't throw your money out a window.

You had better take a look at the possibility of mechanizing your molding department. "Davenport" molding machines will give you better castings in less time at lower cost. We will be pleased to send you one of our illustrated catalogs.

DAVENPORT MACHINE AND *Foundry Company*

DAVENPORT IOWA U.S.A.

REPRESENTATIVES

CANADA
Canadian Foundry Supplies & Equip. Ltd.
Toronto and Montreal

FRANCE * BELGIUM * LUXEMBURG * SWITZERLAND
Ph. Bonvillain & E. Ronceray, Choisy-Le-Roi
Rue Paul Carle, Seine, France

ALL OTHER FOREIGN COUNTRIES
R. K. Price Associates, Inc.
70 Pine St., New York 5, N. Y., U. S. A.

IRONTON CARO-LINE

IRONTON
Foundry Representatives

The Ironton Fire Brick Co.
Ironton, Ohio

The Ironton Fire Brick Co.
Box 4728
Jacksonville 1, Fla.

Beeman Sales & Engr. Co.
629 Buhl Bldg.
Detroit 26, Mich.

Earl A. Swenson
Box 651
Columbus 16, Ohio

Firegan Sales Co.
141 W. Jackson Blvd.
Chicago 4, Ill.

Henry M. Witmyer
1311 Proctor St.
Baltimore, Md.

Pa. Foundry Supply & Sand Co.
Ashland and East Lewis Sts.
Philadelphia 24, Pa.

M. D. Lucas
2116 Keith Bldg.
Cleveland 15, Ohio

Frederic B. Stevens, Inc.
93 Stone Street
Buffalo 12, N. Y.

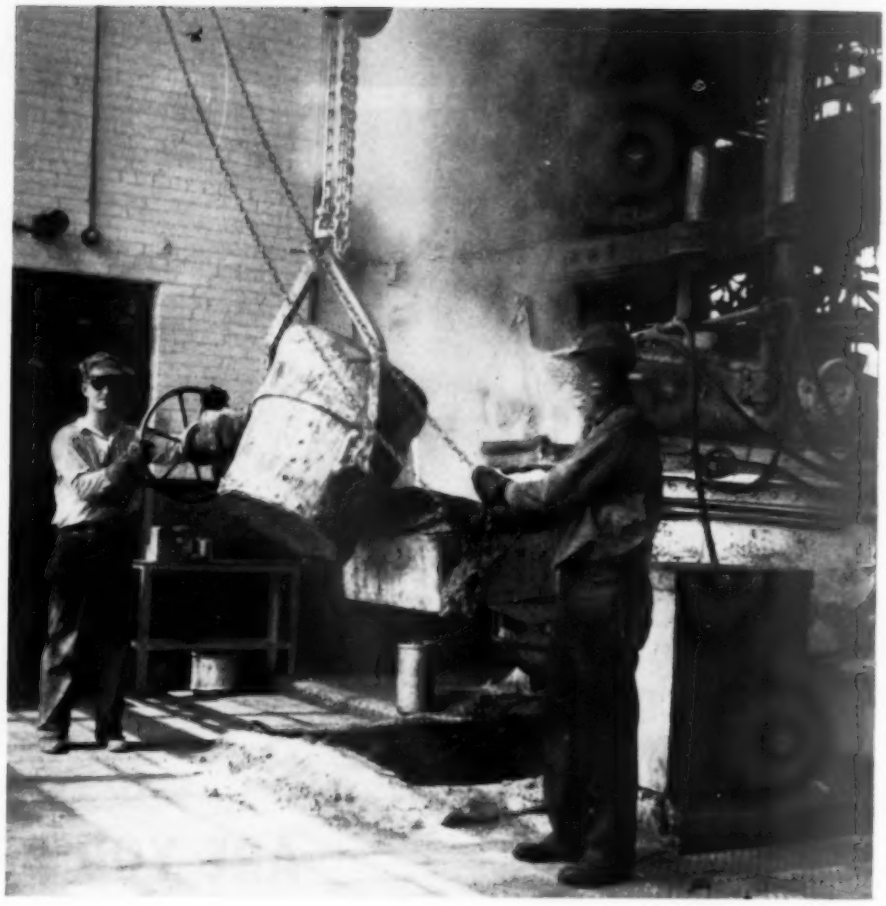
Carl F. Miller Co., Inc.
1217 Sixth Ave. So.
Seattle 4, Washington

Klein-Farris Co., Inc.
683 Atlantic Ave.
Boston 11, Mass.

Interstate Supply & Equip. Co.
647 W. Virginia St.
Milwaukee 4, Wisc.

John A. Pruitt
115 No. 4th St.
Ironton, Ohio

V. C. Shadden
Box 935
Chattanooga, Tenn.

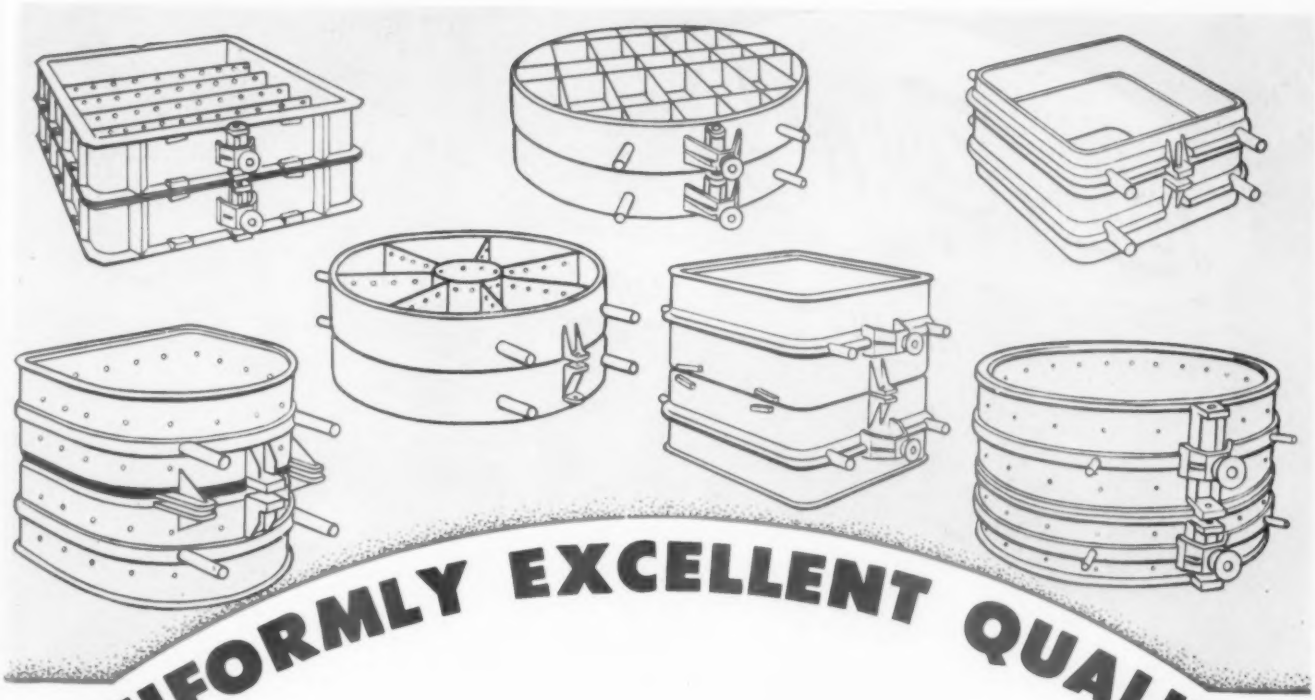


"Ironton Caro-Line", the siliceous ramming refractory is giving fine service in some of the most carefully operated foundries in this country and Canada. It is used for lining ladles handling electric steel, malleable iron, and alloy iron. It is also used for the bottoms and sidewalls in acid electric furnaces and for side blown converters.

"Ironton Caro-Line" is easy to install, reduces labor costs and reduces loss of castings due to slag inclusions.

Ask us for complete information on "Ironton Caro-Line".

THE IRONTON FIRE BRICK COMPANY
RELIABLE REFRACTORIES
IRONTON OHIO



UNIFORMLY EXCELLENT QUALITY

Thousands a year, for nearly two decades . . . yet each Foundry Flask is given individual handling each step through the Black, Sivalls & Bryson plant. That's why all sections are true and interchangeable . . . pinlugs and other equipment are set and spaced precisely . . . parting line and strikeoff are smooth with good bearing. Rigid inspection and close supervision by long-experienced foundrymen, modern production equipment and skilled craftsmen insure precision performance and long life in

BS&B Foundry Flasks

Any shape, any size, with any combination of fittings . . . made to your specifications. Welded steel construction means easier handling, lighter weight, greater strength.

BS&B originated the welded flask . . . pioneered the steel-bushed flask. The efficiency of BS&B production lines means no delay . . . 30-day delivery from receipt of order.

See your nearest BS&B Distributor, or fill in coupon and mail today to the Special Products Division, Section FF10, Black, Sivalls & Bryson, Inc., Power and Light Bldg., Kansas City 6, Mo.

AUTHORIZED BS&B DISTRIBUTOR

Birmingham, Ala. Foundry Service Co.
Boston, Mass. Klein-Farris Co., Inc.
Buffalo, N. Y. Queen City Sand & Sup. Co.
Chicago, Ill. S. Obermayer Co.
Cincinnati, Ohio Hill & Griffith Co. S. Obermayer Co.
Cleveland, Ohio C. L. Nash
Dayton, Ohio Fenton Foundry Sup. Co.
Detroit, Mich. Wolverine Foundry Sup. Co. E. J. Woodison Co.
Edwardsville, Ill. Midwest Foundry Sup. Co.
Elmira, N. Y. F. F. Shortsleeve Co.
Ft. Worth, Tex. Ralph A. Carlson
Los Angeles, Cal. Independent Foundry Sup. Co.
Minneapolis, Minn. Foundry Supply Co., Inc.
Montreal, Can. Canadian Foundry Sup. & Eqpt., Ltd.
Oakland, Calif. Pacific Graphite Co., Inc.
Philadelphia, Pa. Pennsylvania Foundry Sup. & Sand Co.
Pittsburgh, Pa. S. Obermayer Co.
St. Louis, Mo. M. A. Bell Co. M. W. Warren Coke Co.
Toronto, Can. Canadian Foundry Sup. & Eqpt., Ltd.

BS&B FOUNDRY FLASKS

MAIL THIS COUPON TODAY . . .

Special Products Div., Section FF10, Black, Sivalls & Bryson, Inc., 27th Floor, Power & Light Bldg., Kansas City 6, Missouri

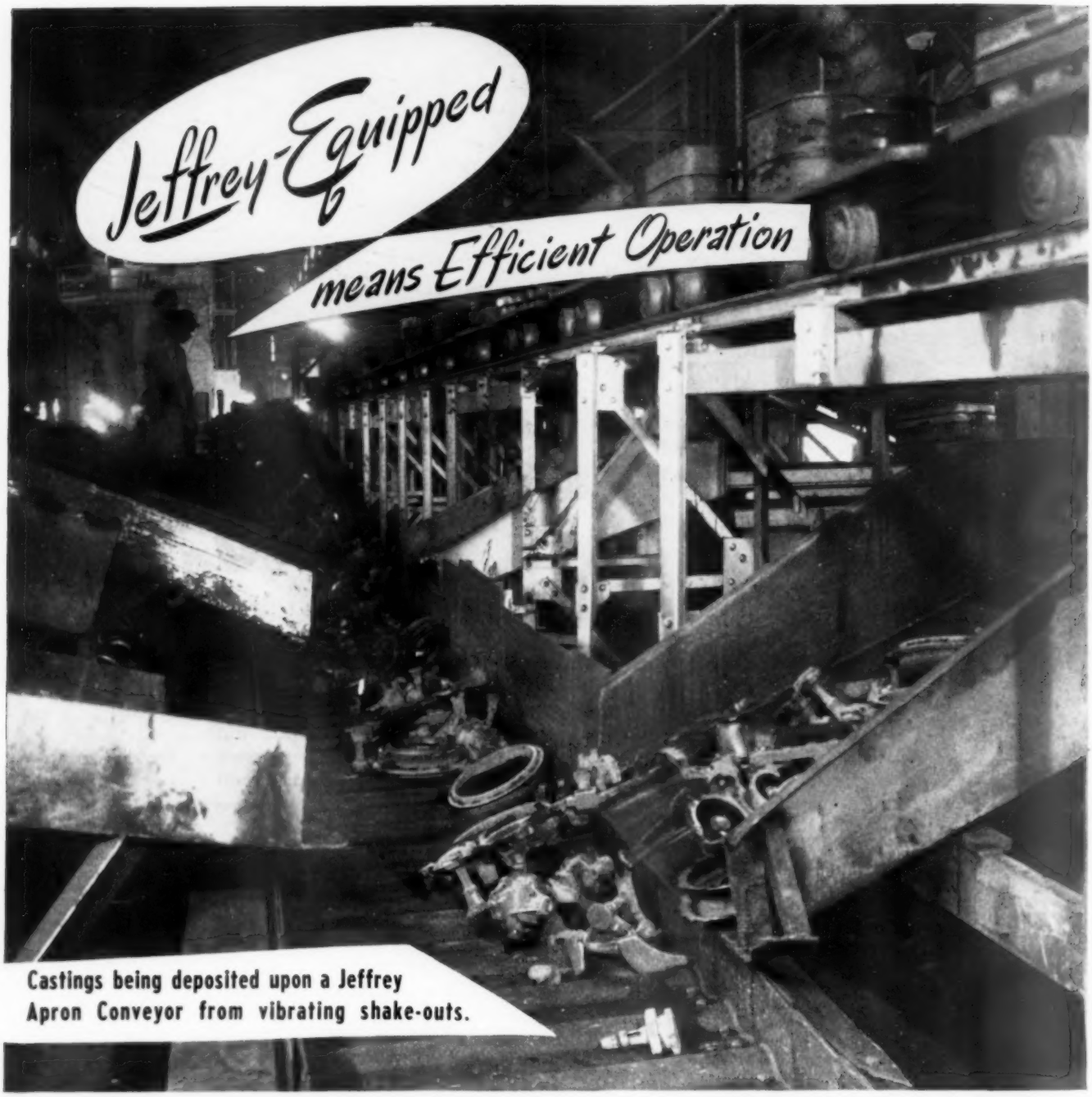
☐ Send latest facts and figures concerning BS&B All-Steel Welded Foundry Flasks.
☐ Please arrange to have Sales Representative call.

NAME _____

FIRM _____

ADDRESS _____

CITY _____ ZONE ____ STATE _____



Castings being deposited upon a Jeffrey Apron Conveyor from vibrating shake-outs.

Photo courtesy Production Foundries Division, Jackson Industries, Inc., Birmingham, Alabama

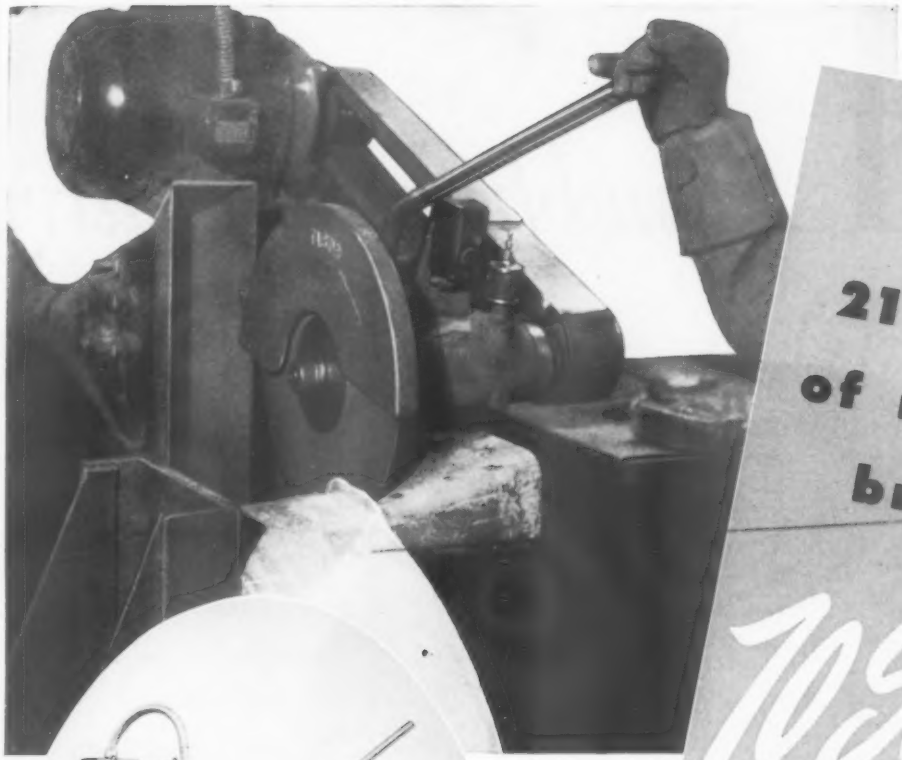
NOTE that the Mold Conveyors are elevated so that shake-outs and hot casting sorting conveyor can be above floor line. This eliminates undesirable and expensive pits.

THE JEFFREY MANUFACTURING COMPANY

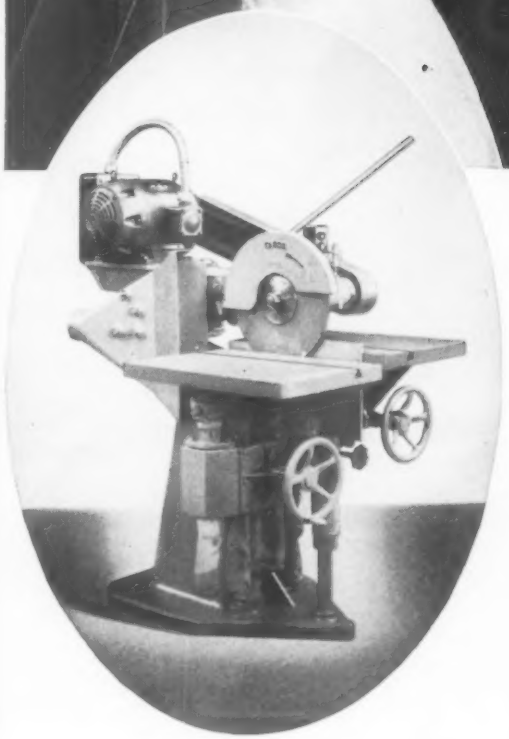
907 North Fourth St., Columbus 16, Ohio

Baltimore 1 · Birmingham 3 · Boston 16 · Buffalo 2 · Chicago 1 · Cincinnati 2 · Cleveland 13 · Denver 2 · Detroit 13 · Harlan · Houston 5 · Huntington 19 · Jacksonville · Milwaukee · New York 7 · Philadelphia 3 · Pittsburgh 22 · St. Louis 3 · Salt Lake City 1 · Scranton 3

Complete Line of Material Handling, Processing and Mining Equipment



Through 21 sq. inches of manganese bronze in 10 Seconds!



That's a mighty fast cut for a 16" wheel driven by a 10 H.P. motor—a good example of how top-speed production schedules are "meat" for Tabor-Brasive Cut-Off Machines.

These rugged machines cut gates and risers from non-ferrous and ferrous castings in a matter of seconds. Clean, close cuts, too, that slash snagging and finish-grinding costs to the bone—often do away with them entirely.

And for the *really tough* cutting jobs—in steel foundries—in copper cutting (either gates and risers or crucible feed stock)—wherever the going's the toughest, Tabor makes a big-value 15 H.P. cut-off.

Any way you look at it, a Tabor-Brasive Cut-Off Machine—equipped with today's hard-to-break, safe-to-use wheels—is *your* answer to more cuts at less cost, with safety.

Write, wire or 'phone for more details.

SPECIFICATIONS

Motor	Table Size (Split Type)	Wheel Diam.	Max. Height of Work Under Wheel
10 H.P.	36" x 25"	16" Max. Thickness—5/32"	20" (with head over table) 46" (with head swung to side)
15 H.P. (Two Speed)	41" x 30"	20" Max. Thickness—3/16"	18" (with head over table) 44" (with head swung to side)
All motors fully enclosed, fan-cooled, ball bearing			

REPRESENTATIVES
Snyder Foundry Supply Company, Los Angeles, Calif.; The Pacific Graphite Company, Inc., 40th & Linden Sts., Oakland 8, Calif.; Carl F. Miller & Company, Seattle, Washington; M. W. Warren Coke Company, 1017 Olive Street, St. Louis 1, Mo.; E. R. Frost Company, Inc., Minneapolis 14, Minn.; Harry H. Reich, Trussville, Ala.

MANUFACTURERS' ASSOCIATION INC. FOUNDRY EQUIPMENT

The TABOR Manufacturing Co.

SINCE 1884 MANUFACTURERS OF FOUNDRY MOLDING MACHINES
6225 TACONY STREET • PHILADELPHIA 35, PENNA.

Lynchburg foundry

mexacote

Lynchburg worker spraying green resin core for clutch housing with a 15° Mexacote solution. Green resin core for transmission is waiting to be sprayed. Baked cores may be dipped for Mexacote treatment.

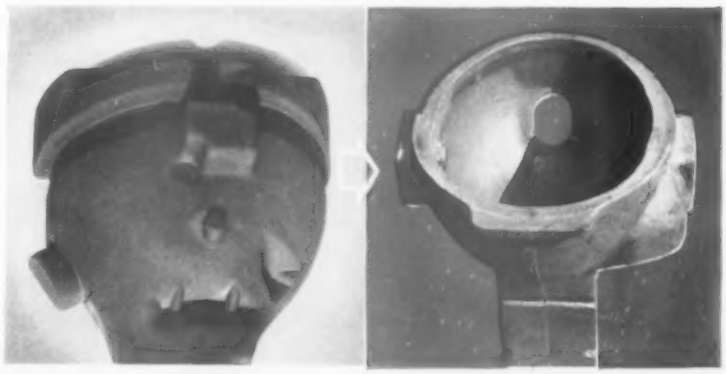
Mexacote-sprayed green resin core for clutch housing is placed in the oven for drying. Some cores are first baked and then given a 40° Baume' coating of Mexacote.

THE UNITED STATES GRAPHITE COMPANY

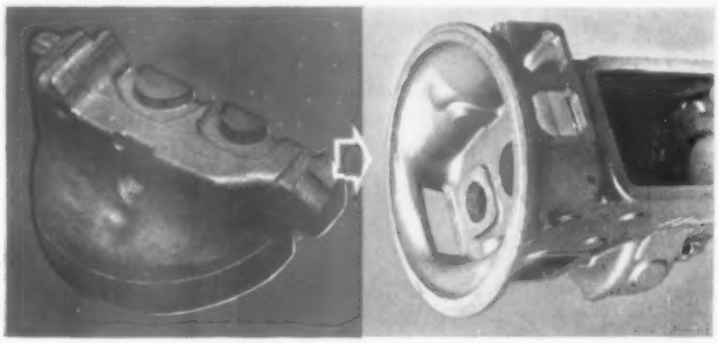
sprays cores with for finer casting finish

To find a product that would produce a high surface hardness on their cores and give a better casting finish, the Lynchburg Foundry Company tested many different products. After exhaustive tests on a wide variety of cores they found that MEXACOTE would do exactly what they wanted it to do. Say Lynchburg engineers: "Now we spray all cores — where spraying is possible—with a 15° Baume' solution of MEXACOTE and the results have been highly satisfactory."

When you want a better casting finish, spray or dip molds and cores with MEXACOTE. It quickly mixes with water and thins to a spraying consistency. MEXACOTE forms a firm coating that will not crack, shrink, scab, peel or buckle under heat, and can be dried by torch, lamp, or oven. A solution of 20° Baume' is usually recommended for spraying, 35° for dipping. MEXACOTE holds true core dimensions, does not run or build up — penetrates sand to prevent burning in. Write for special MEXACOTE bulletin.



From core to casting. The picture at left shows one part of the core assembly for clutch housing after having been sprayed green with Mexacote and baked. At right is the casting. Note fine finish that will require minimum finishing.

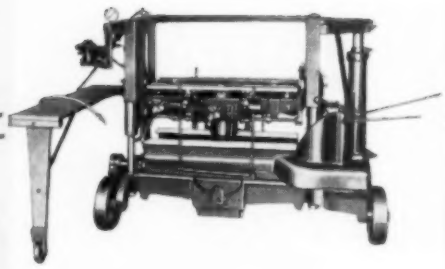


At left, resin cores for part of truck transmission case are sprayed green with Mexacote. At right is the transmission case after casting. Note absence of veining of cored surfaces.

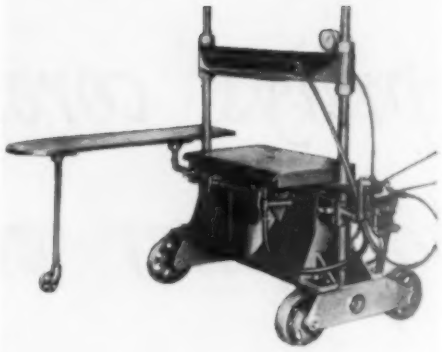
mexacote

DIVISION OF THE WICKES CORPORATION • SAGINAW, MICHIGAN

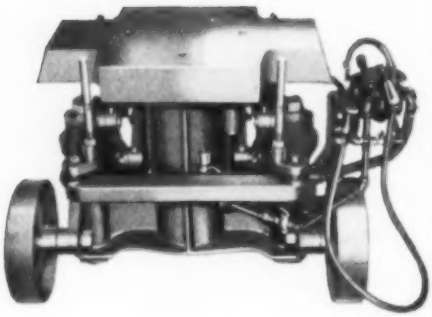
Jolt Squeezer—Arm type
5 sizes



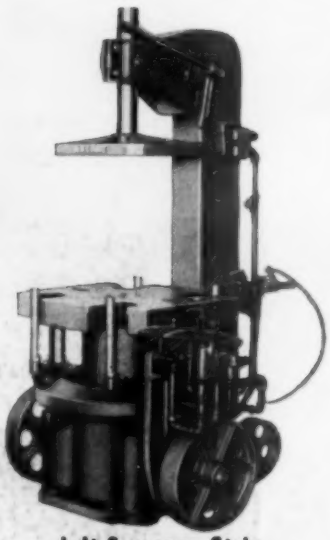
Jolt Rollover Squeeze Draw
4 sizes



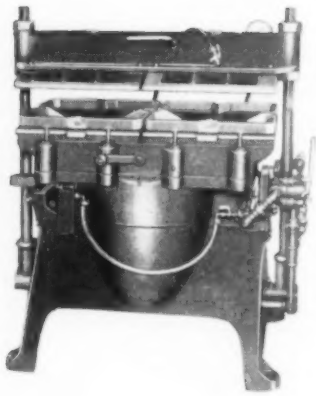
Jolt Squeezer—Strain rod type
2 sizes



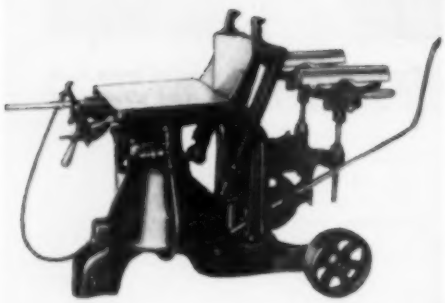
Jolt Pin Lift
3 sizes



Jolt Squeeze Strip
4 sizes



Multiple Molding
3 sizes



Jolt Rollover Draw
3 sizes

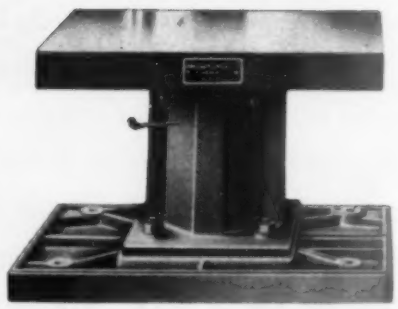
8 Good Ways to
CUT MOLDING COSTS

Here's a molding crew that knows its business—these eight veteran shock troopers proved in the incessant war against lagging production and climbing costs.

You can expect "good news for foundries" regularly from Arcade. Meanwhile send for bulletins.

ARCADE

MANUFACTURING DIVISION
ROCKWELL MANUFACTURING CO.
FREEPORT, ILLINOIS



Plain Jolt
6 sizes

Industry Needs Further Production Economies

RUTHLESS price cutting again is appearing in the foundry industry. Regardless of the fact that most foundrymen understand the inherent dangers in unintelligent price reductions, some producers seem to consider it the only weapon with which to meet competition. They disregard the lessons of past experience which show that slashing prices in itself will not guarantee a continual flow of orders, but does invite retaliation from those who forget consequences in their desire to get or hold business. Those who disregard production costs in their price slashing tactics also seem to forget that giving away currency with each ton of castings can lead only to financial troubles or bankruptcy.

But criticism of unintelligent pricing methods is not meant to suggest that price reductions are not necessary. Economists seem to agree that the present decline in the volume of business will bring about a price readjustment, and that price reductions are needed all along the line if manufacturers are to find mass markets for their products.

In the face of high labor rates, high cost of some raw materials, and insufficient business to operate more than three or four days a week, many foundrymen are somewhat skeptical of the possibility of reducing foundry production costs. Can this be accomplished in the face of the problems now facing the industry?

The Foundry believes that it can be done. Reducing the amount of labor required through greater use of machines and equipment; eliminating waste through improved practices and closer supervision; utilization of the newer developments in foundry practice; giving more attention to design of the casting, to good patterns and to proper rigging for the job; and securing co-operation of employees in an effort to increase production per man-hour, are some of the opportunities which are available to most plants. Last, but not least, the application of progressive and intelligent methods to the sale of castings should be given more attention.

While on the surface business appears discouraging, reports from government and various trade associations show that production still is at a higher yearly rate than was enjoyed by the industry in the years immediately preceding the war. As inventories are worked off, and as foundrymen produce and sell with greater efficiency, the demand for castings again should approach a rather satisfactory level, although on a lower plateau than peak postwar performance.

Frank G. Steinebach
Editor

THE FOUNDRY
WHEREVER METALS ARE CAST

Determination of TOTAL CARBON IN PIG IRON

Comparison of size and shape of graphite formation in: 1— low phosphorus pig iron; 2—cast iron without magnesium and ferrosilicon additions; 3—nodular cast iron

THE accurate determination of total carbon in pig iron and high carbon cast iron has always been a problem, due to the large amount of loose graphite in a drilled sample. Recently our laboratory has had to determine total carbon in a great many nodular graphite cast irons. We have found this type of cast iron also very difficult to sample properly for total carbon determination.

The purpose of this paper is to show the possible methods of obtaining reasonable accuracy for total carbon determinations in these types of irons.

To simply drill a pig iron sample in the usual manner and determine the carbon in the sample as drilled gives greatly varying results and very poor checks. To overcome this variation a set of 3-in. tight-fitting sieves, with cover and pan, were made and the carbon determined by sieve analysis.

The sample is obtained by using a ½-in. drill and drilling through the thickness of the pig, giving us about 50 grams of sample. In sieving the sample we use a 40 mesh, 100 mesh, and pan, shaking the sieves by hand for about 10 minutes. After shaking, the material on the 40-mesh sieve is brushed lightly, with a bristle brush, until no more material goes through. The material passing through is added to the 100-mesh sieve, which is also brushed, and the material passing through the 100-mesh sieve is added to the pan. The three portions, that is, 40 mesh, 100 mesh and pan, are weighed and the carbon determined on them separately by running each in duplicate or until reasonable checks are obtained. One-gram samples are used for the 40 and 100 mesh samples, while a 0.5-gram sample is used for the pan portion. From the weight and percentage of carbon on each portion the total carbon is calculated.

Table I shows several pig irons we have analyzed for carbon by this method. Table II shows the weight of sample and percentage of carbon, with duplicate determinations, on each portion, with the calculated average percentage of carbon for the sample.

When we began experimenting with nodular graphite cast irons, the regular carbon analyses after the magnesium or cerium had been added were lower than those of the plain iron to which the additions were made. This led to the belief that there was some error in the method of sampling for the determinations.

Table III shows some of the results in the determination of total carbon before the magnesium was added to the irons and also after the addition. From the results in this table it will be noted that with the addition of increasing amount of magnesium there is a drop in the amount of total carbon as ordinarily determined. Test No. I 449 shows that there is only 0.07 percentage point difference in carbon between the initial and final sample, while there is a difference of 0.21 between the initial sample and sample No. 3, to which more magnesium was added. The samples used for the analysis in Table III were drilled with a ⅞-in. drill. A 1-gram sample was used for the analysis.

On one of the test bars to which magnesium was added, two different sizes of drills were used to see if the size of the drill made any difference in the carbon determination. A ⅞-in drill and a 3/16-in. drill were used; in each case the carbon was determined in duplicate, the result being shown in Table IV. From this it appears that the larger the drilling the higher, and probably the more accurate, the total carbon shown in the completed determination.

By ROY E. DEAS
Chief Chemist
and LILLIAN T. CONRADI
Analyst
American Cast Iron Pipe Co.
Birmingham

AND NODULAR CAST IRON

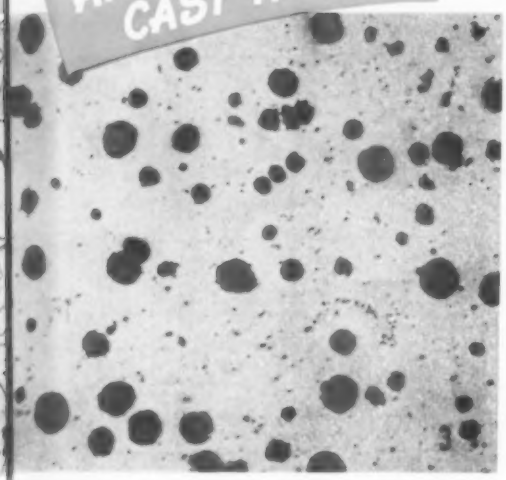


TABLE I—Analyses of Pig Irons Studied

Pig Iron Number	C	Si	S	Mn	P	Si + P
1	4.34	.70	.043	.35	.048	.75
2	4.18	.42	.035	.52	.64	1.06
3	4.18	1.07	.036	.52	.38	1.45
4	4.10	1.21	.042	.65	.35	1.56
5	4.24	1.00	.043	.26	.81	1.81
6	4.44	2.00	.023	.60	.35	2.35
7	4.04	1.74	.060	.50	.68	2.42
8	4.08	2.40	.031	.60	.23	2.63
9	3.94	1.95	.042	.50	.73	2.68
10	3.90	2.35	.050	.75	.83	3.18
11	3.80	2.72	.049	.94	1.48	4.20
12	3.12	5.43	.040	.72	.40	5.83

TABLE II—Sample Weights and Carbon Percentages

Pig Iron Number	40 Mesh Weight in Grams	40 Mesh Per Cent Carbon	100 Mesh Weight in Grams	100 Mesh Per Cent Carbon	Pan Weight in Grams	Pan Per Cent Carbon	Calculated Avg. Per Cent Carbon
		4.04		3.62		6.38	
1	20.836	3.98	16.680	3.57	9.068	6.37	4.34
		4.13		3.78		4.85	
2	22.679	4.08	15.709	3.77	11.846	4.85	4.18
		4.10		3.88		4.80	
3	27.989	4.05	11.473	3.91	9.715	4.81	4.18
		3.99		3.87		5.20	
4	46.118	3.95	16.053	3.83	9.818	5.08	4.10
		3.80		3.64		5.66	
5	11.861	3.78	21.821	3.67	12.828	5.59	4.24
		3.83		3.60		9.42	
6	26.065	3.80	11.846	3.60	5.318	9.27	4.44
		3.63		3.37		6.95	
7	30.764	3.64	19.020	3.34	9.038	6.85	4.04
		3.69		3.49		6.02	
8	31.208	3.74	33.356	3.48	16.747	5.88	4.08
		3.64		3.40		5.80	
9	21.154	3.64	19.865	3.37	9.560	5.72	3.94
		3.29		3.08		7.68	
10	15.396	3.30	22.755	3.08	7.489	7.56	3.90
		3.21		2.30		6.59	
11	18.069	3.25	19.616	2.35	14.004	6.58	3.80
		3.08		2.94		3.57	
12	34.517	3.10	11.960	2.93	6.940	3.56	3.12

TABLE III—Carbon in Nodular Graphite Irons

Test Number	Remarks	Per Cent Carbon
I 376-1	Plain	3.48
I 376-2	0.40% Mg. and 0.40 Si added to ladle	3.40
I 448-1	0.40% Si added to ladle	3.98
I 448-2	0.35% Mg and 0.40 Si added to ladle	3.92
I 448-3	0.58% Mg and 0.40 Si added to ladle	3.61
I 449-Initial	Poured direct from crucible	3.84
I 449-1	0.40% Mg and 0.40 Si added to ladle	3.84
I 449-2	0.63% Mg and 0.40 added to ladle	3.61
I 449-3	0.85% Mg and 0.40 Si added to ladle	3.63
I 449-Final	Poured direct from ladle	3.77
Electric Furnace Heat 37186	Plain	3.87
Heat 37186	0.50% Mg added and 0.40 pts. Si added as FeSi	3.52

TABLE IV—Illustrating Effect of Drill Size

Bar No.	Size of Drill	% Carbon
		3.46
2804	$\frac{7}{8}$"	3.44
		3.22
2804	$\frac{5}{16}$"	3.19

TABLE V—Nodular Graphite Iron Drillings

Bottom of Bar: Bar No.	Size of Sample in Grams	Carbon, %	Center of Bar: Bar No.	Size of Sample in Grams	Carbon, %
2804	1.000	3.43	2804	1.000	3.36
	1.000	3.15		1.000	3.56
	.551	4.43		1.000	3.78
				(all of drillings)	
Calculated average % C		3.54	Calculated average % C		3.56

TABLE VI—Carbon Determination from Drillings

Bar Number	Size of Sample in Grams	Carbon, %	Calculated Average Carbon, %
2739	1.000	4.25	
	1.000	4.25	4.27
	1.000	4.28	
	.134	4.50	
2740	1.000	3.70	
	1.000	3.74	3.78
	1.000	3.78	
	.073	4.91	
2754	1.000	2.08	
	1.000	2.06	2.09
	.245	2.22	
2757	1.000	3.40	
	1.000	3.48	3.46
	1.000	3.42	
	.116	3.92	
2758	1.000	3.18	
	1.000	3.16	3.17
	.579	3.19	

It appears that when the graphite is in the nodular form more of it is lost in drilling than when the graphite is in the flake form. Also, as shown in Table IV, with a small drill and fine chips more graphite is lost than when coarse chips are obtained. For this reason nodular graphite cast iron must be placed in a class with a very hypereutectic pig iron in the difficulty of accurate carbon determination.

The last method of sampling tried is to use 3/16-in. drill and to drill half-way through the bar. This will give between 2 and 3 grams of sample. Then carbons are run on 1-gram portions until the sample is completely used up, the last determination usually being made on a fraction of a gram. From these results the average carbon is calculated.

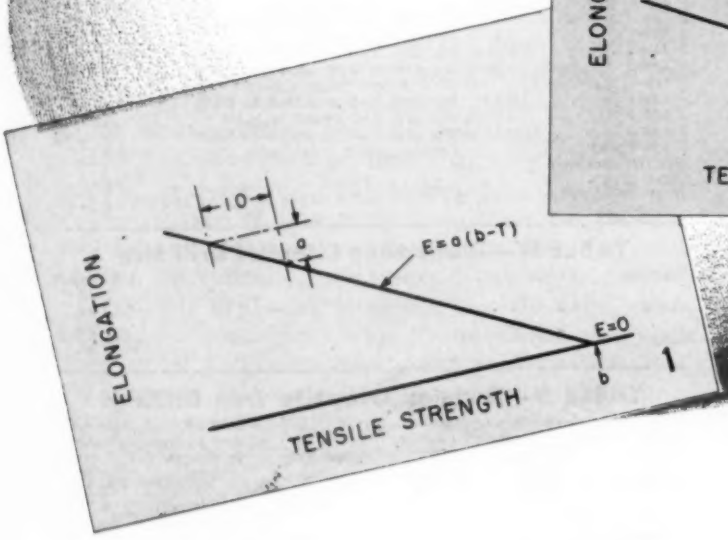
Table V shows results of two drillings of Bar No. 2804, one drilled in the center of the bar and the other at the bottom end of the bar. Results shown in this table indicate it is possible to check the carbon in nodular graphite cast iron, providing all of the sample that is drilled is used. This is the same bar shown in Table IV. Table VI shows the results of other tests where the carbon was determined by the last method mentioned.

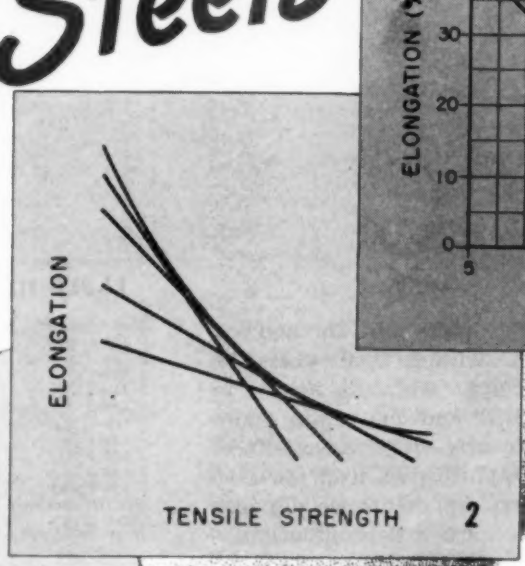
In conclusion, to determine total carbon on pig iron, it is recommended that the sample be sieved. Determine the carbon on individual screens and then calculate the final average per cent of carbon.

For high carbon and nodular graphite cast iron, recommended procedure is either the sieve analysis as used for pig iron, or use of a small drill to determine the carbon on one gram portions, or less, until the sample is used up. Average total carbon is calculated from the individual results.

Static Properties of Cast Steels

By DR. HARRY A. SCHWARTZ
Manager of Research
National Malleable & Steel Castings Co.
Cleveland





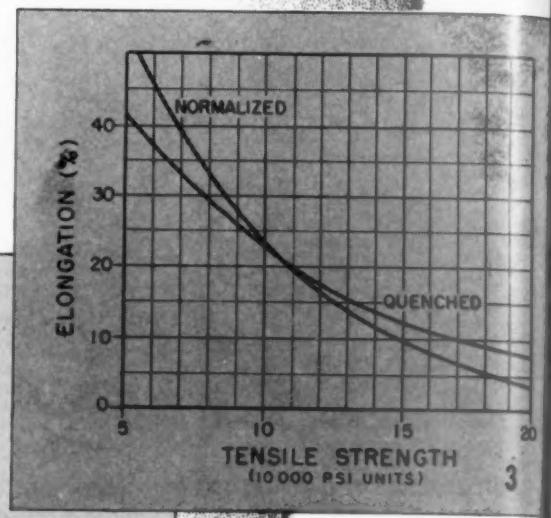


Fig. 1—Relationship of tensile strength to per cent elongation

Fig. 2—Lines plotted from different values of *b*

Fig. 3—Curves to which lines of Fig. 2 are tangent

Fig. 4—Best reduction of area most likely to be obtained for a given tensile strength

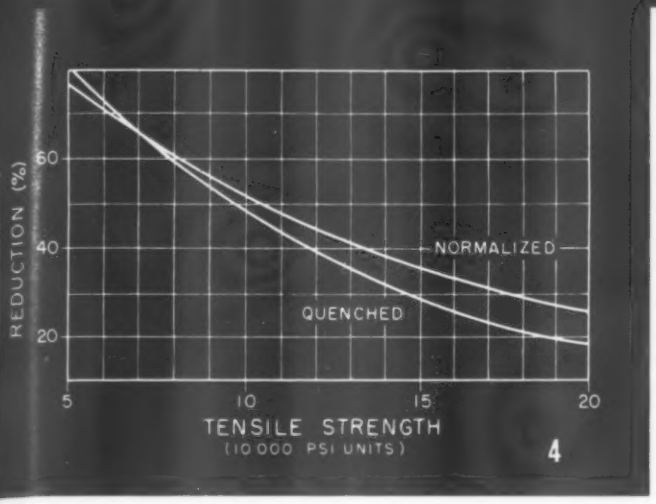
THE purpose of this article is to set out the properties of cast steel which are compatible with one another. That is, we wish to show what values of the properties measured by static tests, tensile strength, yield strength, elongation, reduction of area and brinell hardness can be expected simultaneously in cast steels given unlimited choice as to composition and heat treatment.

The applications, for instance, in the field of specifications are obvious.

Some limitation of the field is practically necessary. The total number of steels studied in the Research Laboratory of the National Malleable & Steel Castings Co., as a background for the present conclusions, is almost 100; each was investigated in from 5 to 25 heat treated states. The investigation so far has extended over about 12 years. Many properties other than those here referred to were studied. The range of composition to which the present conclusions apply is approximately as follows:

Carbon 0.24 to 0.52 per cent, silicon 0.28 to 0.89 per cent, manganese 0.46 to 1.70 per cent, nickel trace to 3.35 per cent chromium trace to 1.12 per cent, molybdenum trace to 0.49 per cent, vanadium trace to 0.15 per cent, copper trace to 1.64 per cent.

The results are for steels containing roughly 0.035 per cent each sulphur and phosphorus. Various traces of deoxidizers — boron, titanium, aluminum — were no doubt present. It is doubtful, however, whether an evaluation of these trace elements would alter



In this paper the most probable interrelation of the static tensile properties are considered quantitatively, both for steels as a group and in relation to chemical composition. Purpose of the paper is to emphasize the point that if any one tensile property is given, none of the others is subject to much variation by the steel foundryman

the *relationship* of the properties studied by a significant amount.

The heat treatments from which the present conclusions are drawn comprised normalizing from 900°C (1650° F), sometimes renormalizing from 820° C (1510° F). The normalized specimens were tested either without tempering or after tempering at various temperatures ranging from 500° C (935° F) to just under the critical point. Also specimens were oil quenched from 900° C or 820° C with or without previous normalizing. Quenched specimens were tempered at various temperatures from 300° C (570° F) to just below the critical point. The present conclusions, however, are limited to tempering at or above 400° C (750° F). It was found that the present data could be adequately described by discussing normalized steels and quenched steels without consideration of further details of heat treatment and also that for specimens of the present size (⅞ to 1 in. diameter) as quenched, no distinction need be made between oil and water quenching. Having thus set out the field studied, we may proceed to the major portion of this paper.

Let the reader understand clearly, in the beginning, that one cannot hope in a field such as this to reach absolutely definite conclusions. There is no theoretical basis upon which the form of the various relations depends, and all that can be done is to derive empirical equations which best fit the multitude of observations. These represent the application of least squares' methods to the data using expressions which seem to give the least "standard error of fit." The standard error of fit is a statistical criterion which measures the likelihood that observed values departing by more than any chosen multiple thereof from the most probable value, will occur. The reader who wishes information as to statistical interpretations should consult an elementary text in that field. If much were said here in elaboration, the result for our present purpose would be confusion.

Be it remembered that we seek to define the most likely value of, let us say, elongation for a given tensile strength. It is not implied that if the tensile strength is measured the elongation can be predicted without chance of being mistaken.

It has long been known that the brinell number of a steel furnishes quite an accurate measure of its tensile strength. Very commonly the relation (1): $T = 500$ Bhn, which says that the tensile strength, in psi, is 500 times the brinell number, is accepted. Experiments in this laboratory showed that, if the brinell number of a given steel in any state of heat treatment whatever be plotted against its tensile strength, all the points fall almost exactly on a straight line. The slope of this line is not exactly the same for all steels but depends upon composition. It ranges from 421 to 500 but its intercept on the tensile axis is such as to bring all the results close to the 500:1 ratio within the realizable range of brinell number. This is the most consistent relation so far found among the static properties.

Before proceeding to other relationships it will be well to point out that the equations representing them do not, of themselves, indicate whether a given value, as for instance of strength, can in fact be achieved. The equation only states what value, say of elongation, would accompany that strength if attainable. Later something can be said about the range of attainable values.

We noted first that if tensile strength be plotted against elongation for a given steel in many states of heat treatment, a straight line seemed to result. Further study, however, indicated that actually two straight lines, intersecting one another, should be used; one for normalized and tempered steels and one for the steel quenched and tempered. When fully annealed the steels' properties are inferior to the relationship of the normalized steel, and tempering temperatures below 400°C (750° F) give relations superior to the indication of the trend lines.The following conclusions are, therefore, limited to two groups of heat treatments—normalizing, possibly with subsequent tempering, and quenching with subsequent tempering between 400° C and the steels' A_1 temperature.

Such relations are expressed by an equation (2): $E = a(b-T)$, in which E is per cent elongation; T tensile strength, hereafter designated in 10,000 psi units for brevity; a is the slope of the line, i.e., the decrease in elongation for unit (10,000 psi) increase in tensile strength, and b is the point (in 10,000 psi) at which the line crosses the tensile strength axis (E = O). Fig. 1 illustrates the matter further. It is found that a and b vary greatly with the composition of the steel, about which more later.

Regardless of composition, it is found that there is a pretty accurate relation between the a and b for any steel, expressed for normalized steels by the equation (3): $\log a = 1.7163 - 0.07050\ b$; and for all quenched and tempered steels by (4): $\log a = 1.4019 - 0.05239\ b$.

If one plots a series of lines corresponding to one of these equations for a series of values of b, one gets a group of lines such as are shown in Fig. 2 and which plainly are all tangent to a single curve. The equation of this curve can be computed from equations (3) or (4) and is found to be, for normalized steels (5): $\log E = 2.07 - 0.0705\ T$; and for quenched and tempered steels (6): $\log E = 1.89 - 0.0524\ T$.

These equations are represented graphically in Fig. 3. Consideration of Fig. 2 will show that they represent the highest values of E for given values of T which can be expected.

It will presently appear that the foregoing equations are subject to a slight change with chemical composition involving a rather unimportant variation in E. Repeating an earlier caution, the reader is again warned that these curves extend indefinitely in both directions, including entirely impossible values of E and T. They must, in application, be considered in connection with the question whether the E or T is realizable. These curves shed no light on that question. The answer must be sought in other data to follow.

Equations (5) and (6) intersect near $T = 10.4$ where $E = 22$ per cent. For lower strengths, normalized steels have higher elongations; for higher strengths, quenched and tempered steels have higher elongation. The value 10.4 is the most likely point marking the shift from one heat treatment to another; for various steels some scatter about the above values would occur. Similarly, actual values of E would scatter about the loci of (5) and (6). The relation is the most likely one but subject to some variation.

However, the equations indicate relative values which set limits above which specifications should not set requirements. While we are on the subject of specifications, the specified values must allow the manufacturer a margin for such scatter which arises, not from his fault but merely from the fact that no operation can be reproduced exactly. Thus (5) at $T = 10$ (100,000 psi) gives log E as 1.3650, corresponding to $E = 23+$. The most probable value for a normalized steel is 23, but even with proper selection of a composition some elongations will turn out higher and others lower. A margin of 3 to 5 per

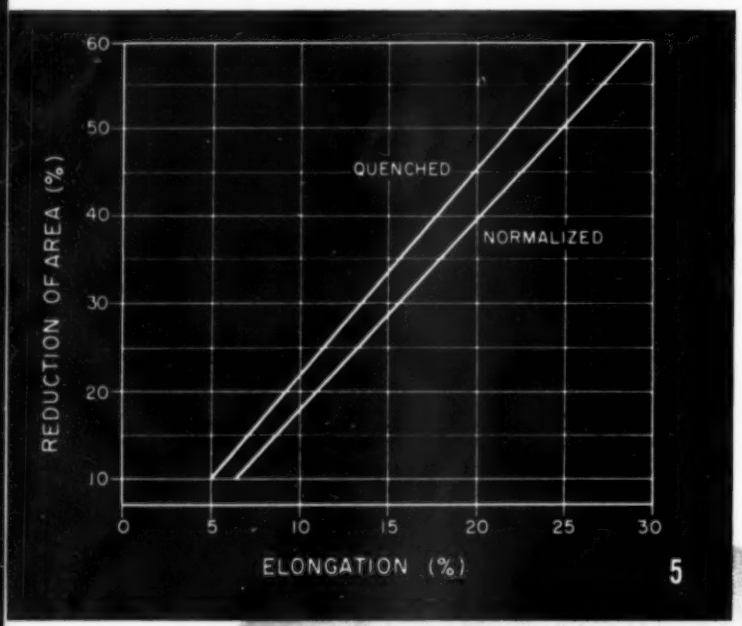


Fig. 5—Relationship of elongation to reduction of area

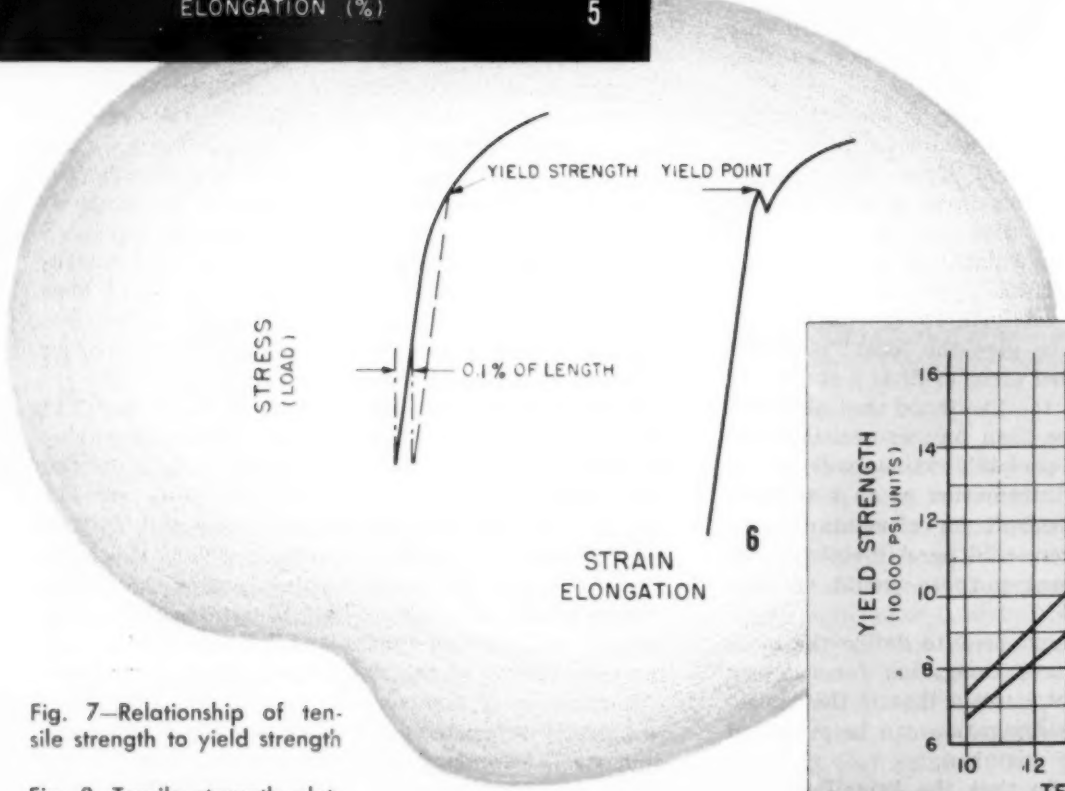


Fig. 6—Stress-strain curves of steel

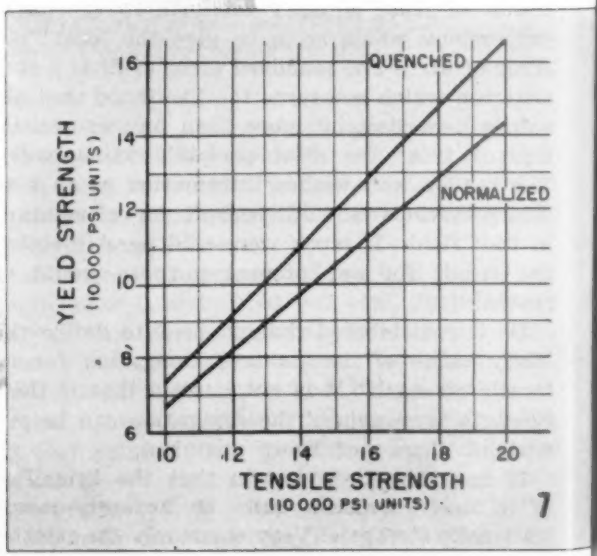


Fig. 7—Relationship of tensile strength to yield strength

Fig. 8—Tensile strength plotted against X from Table II

cent may be required, varying somewhat with values of T.

The relation of reduction of area to tensile strength can be handled in the same manner. The scatter of points about a straight line correlating reduction of area with tensile strength is decidedly greater than for the elongation relation. Another variable also manifests itself in the character of fracture. Steels showing cupped tensile fractures show high reductions of area for a given elongation. These steels yield fairly predictable results. Poor fractures follow the elongation relation effectively but not a reduction-tensile relation derived from good fractures. Also, there are applied mechanics reasons why reduction of area, being related to rates of work hardening, might require consideration of other factors than elongation.

The tests of our 25 steels excluded notably bad fractures but it is possible that, since the data were collected before the fracture matter was studied in detail, the following equations are less accurate than (3), (4), (5) and (6). Corresponding to these equations the following have been derived for the reduction of area-tensile strength relation:

For normalized steel (7): $\log a = 1.34014 - 0.031975\ b$; and (8) $\log R = 2.0387 - 0.03198\ T$.

For quenched and tempered steel (9): $\log a = 1.53399 - 0.042528\ T$; and (10): $\log R = 2.1088 - 0.04253\ T$.

The loci of (8) and (10), marking the best reduction most likely to be had for a given tensile strength, are shown in Fig. 4. The two lines intersect at about $T = 6.65$ (66,500 psi). This is about as low a strength as we will ever be concerned with and demonstrates that for a given tensile strength, normalized and tempered steels always have the better reduction of area. The mathematical conclusion is somewhat surprising.

The most probable relation of E and R cannot be deduced from what has gone before, but evaluating the observed values obtained in the research produced the following equations:

For normalized steel (11): $E = 2.5 + 0.457\ R$, or $R = 2.188\ E - 5.47$.

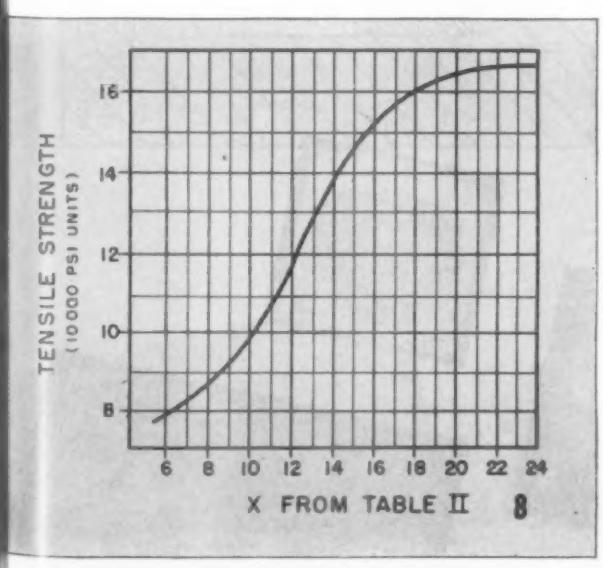


TABLE I

COEFFICIENTS FOR ELONGATION AND TENSILE STRENGTH

	Normalized		Oil Quenched	
	log a	b	log a	b
Constant	0.9042	12.68677	1.2279	5.68687
Coef. of C	0.00336	—0.04970	—0.01220	0.18104
Si	—0.00349	0.02807	—0.00100	0.01021
Mn	—0.00222	0.03217	—0.00165	0.03188
Ni	—0.00076	0.01088	—0.00073	0.01267
Cr	—0.00196	0.02900	—0.00130	0.03296
Mo	—0.00300	0.02546	—0.00431	0.06893
V	—0.00123	0.04075	—0.00194	0.05937
Cu	—0.00101	0.01629	—0.00095	0.01520

COEFFICIENTS FOR REDUCTION OF AREA AND TENSILE STRENGTH

	Normalized		Oil Quenched	
	log a	b	log a	b
Constant	1.2085	6.18513	1.1317	15.76914
Coef. of C	—0.001622	—0.14281	—0.01049	0.09027
Si	—0.00527	0.12378	0.00110	—0.05526
Mn	—0.00184	0.09342	—0.00013	0.00988
Ni	0.00016	0.00075	—0.00080	0.01519
Cr	—0.000100	0.03984	0.00031	—0.00094
Mo	0.00154	0.10624	—0.00385	0.08862
V	0.00146	—0.17456	—0.00962	0.27197
Cu	0.00047	—0.02954	—0.00032	0.00089

TABLE II

COEFFICIENTS FOR CALCULATION OF TENSILE STRENGTH RANGE

	Minimum Strength	Strength Quenched and Tempered at 400° C	For Use in Calculating Normalized Strength (*)
Constant	3.7798	—3.4912	—1.4548
C	0.0679	0.1786	0.1450
Si	0.0102	0.0467	0.0074
Mn	0.0159	0.0522	0.0418
Ni	0.0047	0.0184	0.0129
Cr	0.0095	0.0538	0.0561
Mo	0.0196	0.1217	0.0621
V	0.0119	0.0639	0.0894
Cu	0.0060	0.0182	0.0170
* Ideal critical diameter.			0.1517

* See Grossman's "Hardenability Calculated from Chemical Composition," *Transactions* AIME, Vol. 150, page 229 (1942).

For quenched and tempered steel (12): $E = 0.9 + 0.434\ R$, or $R = 2.304\ E - 2.07$.

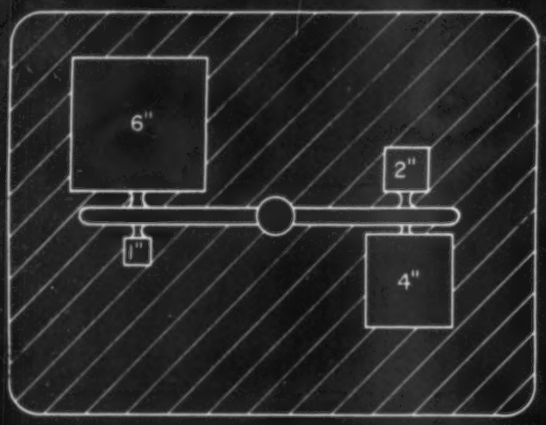
Note the qualitative similarity to the common rough approximation that the reduction of area is twice the tensile strength. The loci of the two equations are shown in Fig. 5. The two lines intersect at a negative, hence impossible value of E, and for given elongation the reduction of area is always better in the quenched and tempered state than in the normalized state, corroborating qualitatively the usual opinion.

Yield points, or yield strengths, require somewhat more extended discussion. The stress-strain curves of steel may be of either of two types shown in Fig. 6. In one type elongation, there is a stress (load) at which the strain (elongation) increases without any increase of stress; sometimes the stress even decreases. The specimen stretches without the load increasing; the stress where this begins is called the yield point. In the other form the diagram is a smooth curve and there is a constant increase in rate of stretch with load. There is no one unique point of any kind on this curve but one can artificially define a yield strength as the stress producing a given amount of permanent elongation, usually 0.1 per cent. This is a yield strength and depends upon an arbitrary definition.

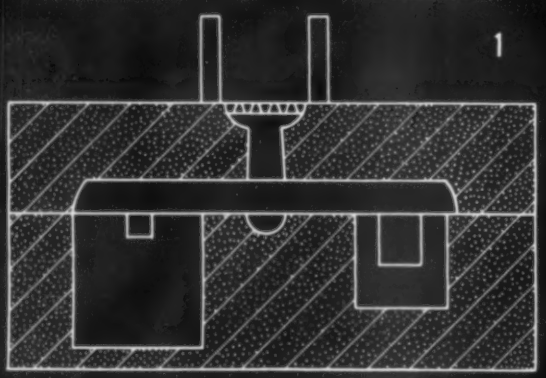
Our tests indicate that there is no significant difference between the relation of yield strength (0.01 per cent set) to tensile strength and of yield point to tensile strength. For normalized and tempered steel (13): (*Please turn to page* 184)

Use of TELLURIUM

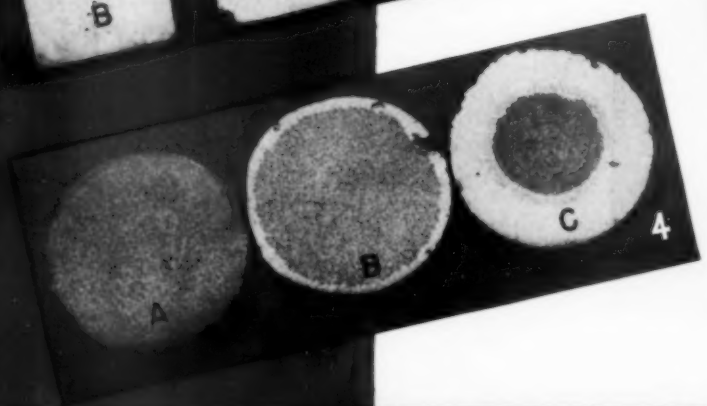
in Promoting Chills on Gray Iron Castings



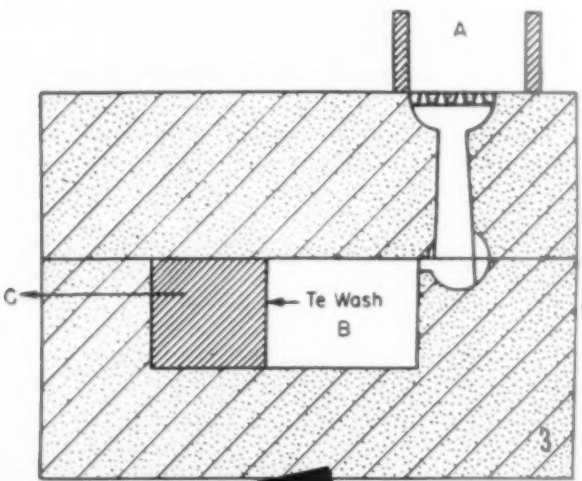
1



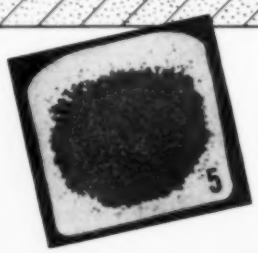
2



4



3



5

6

THE use of tellurium metal as an addition to cast iron to promote certain useful property characteristics has been protected by a number of letters patent.* The technology has received relatively scant attention in the literature, however, and the purpose of the present paper is to direct attention to some of the property and metallographic characteristics which may be induced by the controlled use of tellurium metal.

Perhaps the primary use of tellurium as an addition to cast iron is to promote the formation of a hard chilled iron either with or without the use of a chill back. Tendency to the formation of a chill can

By DR. C. R. AUSTIN
Assistant to President
Meehanite Metal Corp.
New Rochelle, N. Y.

also be obtained by the addition of carbide forming elements to the cupola charge or to the ladle. Advantages in the use of tellurium, however, include:

1. The amount of tellurium added is quite small, ranging from under 0.1 per cent to 0.005 per cent or less dependent on the nature of the iron and on the chill required.

2. The use of elements like chromium result in the development of free carbide networks or of mottling in the unchilled sections of the castings. With tellurium the chill effect is not dependent on the introduction of alloy carbides, and the chill may be restricted to a given depth of case.

3. The amount of massive carbide in the chill is increased so that a high hardness with excellent wear-resisting properties are developed.

4. The transition zone from white iron to gray iron is normally quite sharp compared with the mottled zone obtained with the usual carbide forming elements.

5. On remelting scrap the effect of the tellurium disappears; hence scrap segregation, essential with chromium additons, is quite unnecessary.

6. The use of metal chills, which may be quite expensive, may be eliminated with tellurium.

Tellurium Metal—Tellurium metal is a transitional element in the sixth group of the periodic table along with sulphur and selenium. It has a hexagonal crystal structure similar to graphite, as compared with the orthorhombic system for sulphur, and hence it might be expected to be a graphitizing agent. The metal has an atomic weight of 127.6, a melting point of about 840°F and a boiling point of 2530°F.

It is readily obtained in powder form or as pellets containing about 99 per cent tellurium bonded with an organic binder. It is also available in lump or pellet form as a copper-tellurium compound containing upwards of 50 per cent tellurium metal.

Added to iron in larger amounts it forms a telluride, but metallographic evidence of this phase is lacking in the very small amounts employed for the purpose of promoting a chill.

The metal or its copper alloy may be used in several forms including:

1. Ladle addition as tellurium metal, powder or pellets, or as a copper-tellurium alloy.

2. Ladle additions of the powder enclosed in a thin copper sheath.

3. A mold or core wash or spray.

4. As an impregnation in the surface sand of a mold or core.

The purpose of alloying tellurium with an element such as copper for ladle additions, or of delaying the effective reaction of the metal, as in a core wash or sand impregnation, is dependent on the fact that tellurium does not function as a simple true alloying element. The quantities are so small and it so readily oxidizes or volatilizes, because the boiling point of the metal is lower than the temperature at which iron is usually tapped from the cupola or other melting unit.

Base Iron to be Treated—All iron founders are familiar with the ideas that some irons are soft and some are hard and that these terms can be associated with irons which have varying degrees of susceptibility to chill. While this tendency to chill may be associated with the silicon content of the iron, other factors are important.

Independent of physico-chemical characteristics of the metal, it is well known that, for any given iron, the rate of cooling can determine whether a white or a gray fracture will be obtained in the solidified casting. Thus in very general terms if the section is "thin enough" the casting will be white while if the section is "heavy enough" the casting will show a gray fracture.

This indicates that each iron must have what may be termed a "critical cooling or solidification rate" which must be exceeded if a hard white fracture is to be produced. Rates of cooling *slower* than this critical cooling or solidification rate will result in an iron with a gray fracture. Where the rate of solidification approximates this so-called critical rate the casting will exhibit a mottled or transition structure.

The function of the additions of tellurium metal is to reduce this cirtical cooling rate. Hence, the following comments should be readily understood:

1. The degree or depth of chill for any given iron

* Letters Patent: 2,364,922; 2,281,460; 2,250,489; 2,250,488.

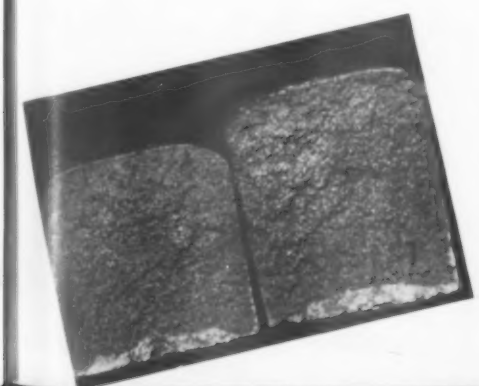


Fig. 1—Details of pattern plate and mold for casting test blocks
Fig. 2—Wheel metal cast on chill. *A*—Untreated metal cast on steel chill. *B, C, D*—Wheel metal ladle treated with 0.005 per cent Te, with *B* cast on steel, *C* cast on graphite, *D* cast on block zirconium sand
Fig. 3—Details of mold for casting test block. *A*—Pouring basin with strainer core. *B*—Test block 6 x 4 x 4 in. *C*—Cast iron chill block 4 x 4 x 4 in.
Fig. 4—Polished and etched transverse sections of arbitration bars cast in core, wheel metal treated with tellurium in ladle. *A*—No Te; *B*—0.005 per cent Te; *C*—0.01 per cent Te
Fig. 5—Polished and etched section of wheel metal treated with 0.005 per cent Te and cast in open 1-in. square x 12-in. long green sand mold without base chill (compare with Fig. 4)
Fig. 6—Polished and etched section of wheel metal poured onto steel chill plate to form casting 1 in. sq. x 12 in. long in open green sand mold. *A*—No Te; *B*—0.005 per cent Te to ladle
Fig. 7—Appearance of fractures of 1-in. square bar of wheel metal cast in open green sand mold with 5 per cent Te powder added to facing sand in bottom of mold

Fig. 8—Seven-in. diameter gear cast in core. Shows chill obtained on teeth where tellurium wash was applied

Fig. 9—Direct view of fracture of teeth from gear illustrated in Fig. 8. Core without and with tellurium wash, respectively

Fig. 10—Fracture of typical controlled chill obtained in a car wheel

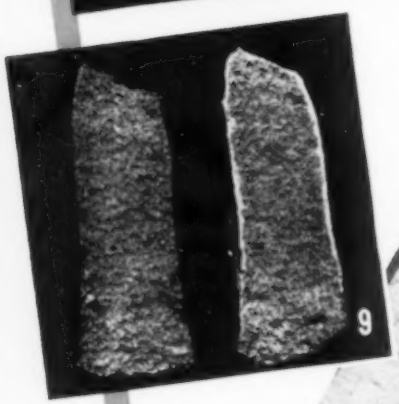
will be greater with increasing quantities of tellurium metal addition. Since the additions are not true alloying additions the depth of chill will also depend on the effectiveness of the method of tellurium treatment.

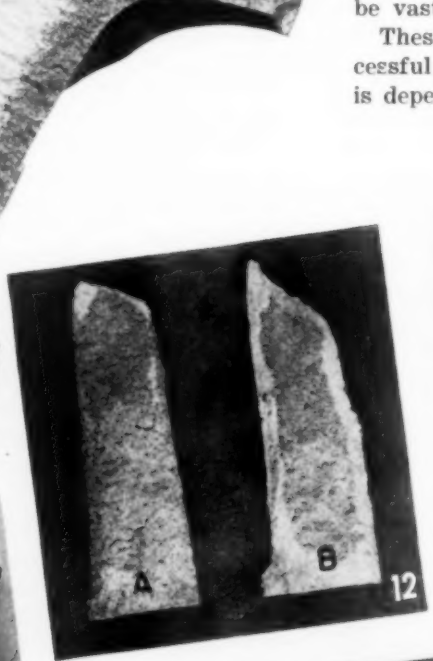
It is important to emphasize both these points particularly since the latter is as equally important as the former.

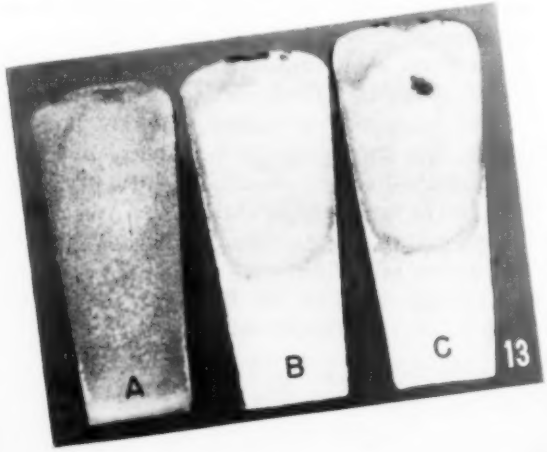
2. The degree or depth of chill for any given tellurium treatment will depend on the character of the iron.

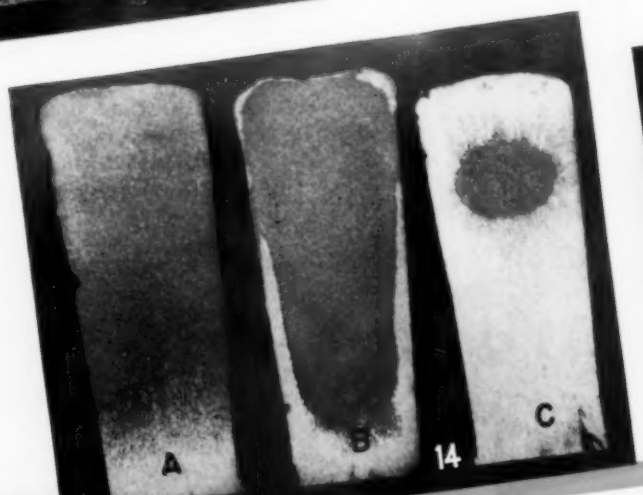
This relates specifically to the tendency to chill as indicated by what has previously been termed the critical cooling rate or critical rate of solidification. Thus an iron used for the manufacture of chill car wheels will chill much deeper or in much heavier section than a soft gray iron used for ordinary light work foundry purposes. The reaction of a car wheel iron to a defined tellurium treatment will similarly be vastly different from that of the soft gray iron.

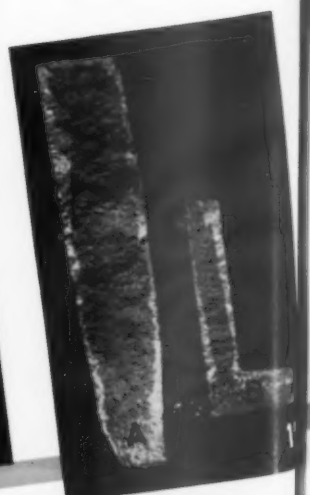
These observations should emphasize that the successful use of tellurium metal as a chilling medium is dependent on control, particularly with respect to:











1. Character of the iron to be treated.
2. Amount of tellurium used.
3. Effectiveness of method of treatment.

Ladle Additions of Tellurium—The simplest method of promoting chill is to make additions to the ladle. Tellurium powder or pellets may be used but the preferred method consists in adding the element in combination with approximately equal parts of copper in small lump form, as copper-tellurium pellets or as tellurium powder sealed in a thin copper tube.

Table I indicates the results obtained when a gray iron was treated with varying amounts of tellurium metal. The iron used in these tests contained 3.0 per cent carbon, 1.35 per cent silicon, 0.80 per cent manganese, 0.095 per cent sulphur and 0.15 per cent phosphorus. It was cast in the form of a square bar 2 x 2 x 4 in., and after cooling it was cut through the center so as to expose a square section 2 x 2 in.

In some tests conducted on high, medium and low tensile strength cast irons designated X, Y and Z, respectively, Fig. 1 shows the detail of pattern plate used for molding test blocks of 1, 2, 4 and 6-in. edge using a simple runner and gating system.

The tellurium was added by placing ⅛ to ¼-in. size pieces of 50:50 copper-tellurium alloy in the bottom of a 300-lb ladle.

The blocks were blasted and then fractured to determine the chill effect. The heavier blocks were fractured by first drilling holes in the casting and then breaking under a steam hammer.

Examination of Fractures — Examination of the fractures showed that with the high tensile irons (X in Table II) 0.025 per cent tellurium addition was sufficient to promote a chill over the entire cross section of the 6-in. block. With the additions of greater amounts than necessary to effect a complete chill the castings tended toward the development of gas porosity toward the center of the metal.

With the medium strength irons (Series Y) similar comments are applicable. With the soft iron (Series Z), however, a chilled structure was not obtained even with the use of a concentration of 0.1 per cent tellurium in either (*Please turn to page* 228)

Fig. 17—Fractures of wedge-shaped casting in soft iron treated in the ladle with 0.1 per cent Te and poured into green sand mold

Fig. 18 — Polished, etched section through sprocket teeth poured with soft iron into core with tellurium wash located at teeth section

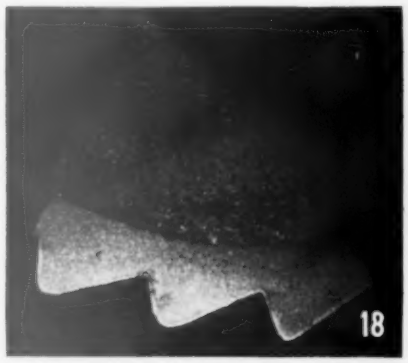
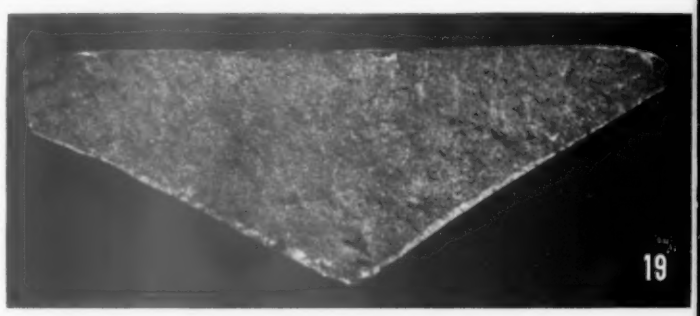


Fig. 19—Fracture of casting poured in soft gray iron into core with facing sand on sides impregnated with ½ per cent Te



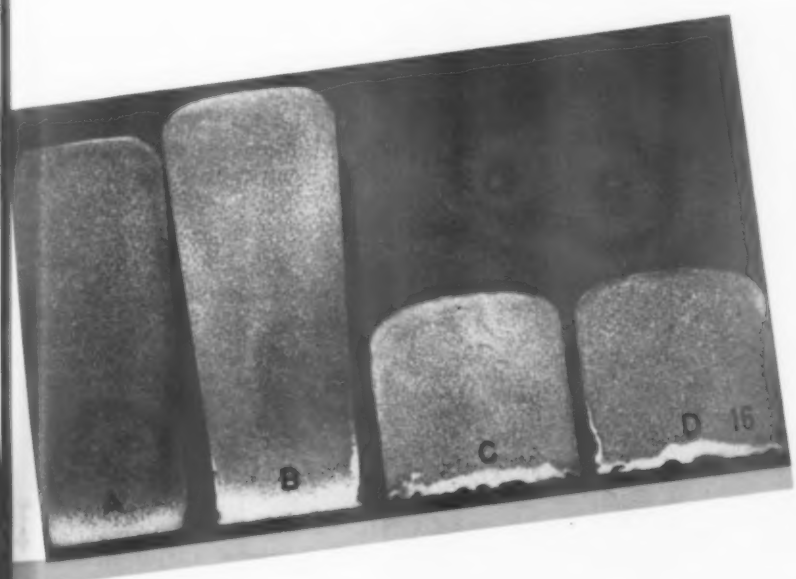


Fig. 11—Fractures through sprocket teeth cast in wheel metal. Left: Untreated core. Right: Core locally brushed with tellurium wash. Lower right section: Polished and etched surface

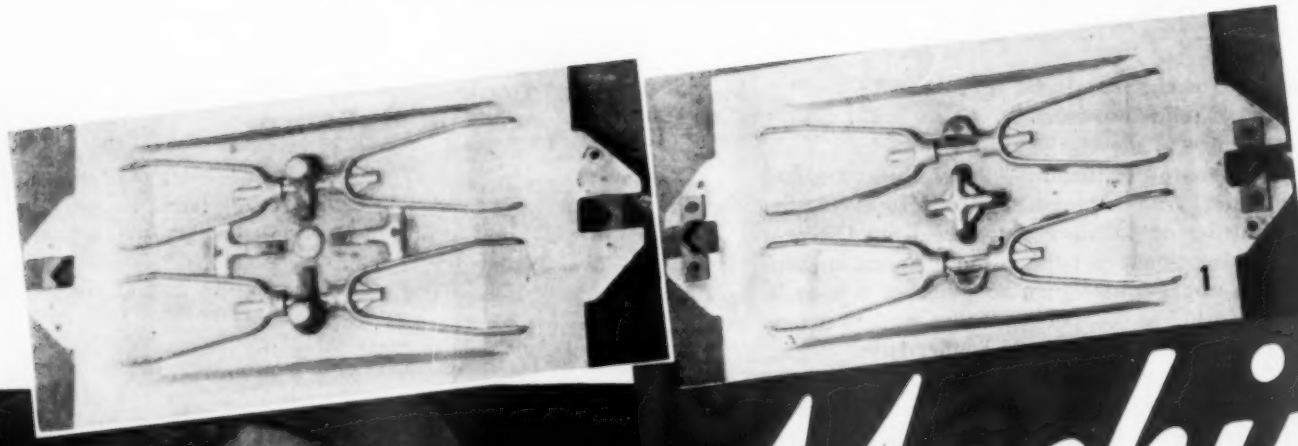
Fig. 12—Fractured teeth from gear (see Fig. 8) cast from high tensile iron. *A*—No treatment; *B*—Tellurium wash on core

Fig. 13—Polished, etched sections of soft iron cast on chill: *A*—Ladle treated with 0.01 per cent Te; *B*—With 0.05 per cent Te; *C*—With 0.1 per cent Te

Fig. 14—High-tensile iron cast on chill block. Polished and etched sections after ladle treatment: *A*—No addition; *B*—0.005 per cent Te; *C*—0.01 per cent Te

Fig. 15—Fractures obtained with high-tensile iron: *A*—Transverse section of wedge-shaped casting, cast in green sand with tellurium wash; *B*—Sprocket cast in core with tellurium wash

Fig. 16—Polished, etched surfaces of soft gray iron: *A* and *B*—No and 0.005 per cent Te to ladle and cast on steel chill; *C* and *D*—Regular soft iron poured into green sand mold with facing sand at base impregnated with 5 and 10 per cent Te, respectively



Machine

This is the first of four articles describing machine molding practice in the steel foundry. Hand molding methods were discussed in five articles starting with the November, 1948, issue

By JOHN HOWE HALL
Consultant
Swarthmore, Pa.

Fig. 1 — Cope and drag patterns mounted on boards

Fig. 2 — Large squeezer type molding machine

Fig. 3 — Closing a snap-flask mold

e Molding

STEEL CASTINGS

IN THE early years of the present century, there were no molding machines in any American steel foundry, and molding was done entirely by the hand methods described in preceding issues (November, December, 1948; January, February, March 1949). The author vividly recalls his first day's work in a steel foundry, when he shoveled all the sand in a false cope and a drag, for crew making up a mold from a fairly large one-piece pattern. On that sweltering August afternoon, it was something of a shock to be told to knock the sand out of the false cope, and to bend an aching back to the task of filling up the real cope that came next on the program. Conditions in the shops of that day had prevented the adoption of labor-saving machinery and had restricted production to what could be turned out by the slow and expensive methods of hand work.

Today, that pattern, which kept four men busy some 14 hours, probably would be split and mounted on cope and drag boards, and the mold would be completed on a machine in less than a half hour. Similar savings have been attained in the production of cores, some types of which are now turned out at a rate of hundreds per hour, instead of the scores per day that could be made by hand. In the forty-odd years since that false cope job was made, the development of mechanical methods has been literally startling, and the economies attained have been an important factor in the success of the foundry industry.

Cost savings secured by the use of molding machines depend chiefly upon the greatly increased rate at which the flasks can be filled with sand, rammed and finished up, when mechanical methods replace hand work. The type of castings to be produced, and especially the number to be made from each pattern in a given time, are the factors governing the extent of the savings that will be attained. In shops that are set up to make very large numbers of castings from relatively few patterns, every piece of equipment is selected and placed with a view to getting the flasks to the machine, the sand to the flasks and the rammed-up molds to the place where they are to be poured, with an absolute minimum of lost time.

The sand is brought to bins over the machines by conveyors and the operators drop it into the flasks as they need it, just like turning on the water for a shower bath. Flasks come from the shakeout on conveyors, are placed on the machines with no loss of time, and when rammed are turned over to the finishers and core-setters, usually on some sort of mechanical conveyor or roller path. The cores are brought to the finishing stations so that the men can pick them up almost without looking. Flasks are "tailored" to the job so that only the minimum amount of sand is used around the patterns, and the machines that ram the sand are of the type best suited to the job in hand. Everything, in short, is so laid out that "assembly line" methods are followed 100 per cent.

Complete mechanization of this sort is advisable only in the shops that produce a few standard parts, in orders running into the thousands. In many steel foundries, the expense of operating and maintaining so much mechanical equipment, with the constant shut-downs involved in changes of patterns, core-boxes and flasks, would simply increase the overall costs of castings. However, even the average steel foundry can make large savings in molding costs, compared with those of hand methods, by the judicious selection, placing and operation of suitable types of machines. How far it is advisable to go in the installation of sand and mold conveyors and other mechanical equipment, depends largely upon how varied a line of work is to be produced.

Jobbing shops, of course, must be so equipped and laid out that a wide variety of work may be made without undue delay. Flasks must be so chosen, for instance, that they can be used to mold up castings of many different sizes and shapes. The economies in the use of sand that are possible in flasks designed for the particular job cannot be secured under such conditions; nevertheless, even in jobbing work a very large number of castings are made which can be

mounted economically on boards and handled on machines. In addition, the simpler types of machines, such as squeezers, plain jolters and small sand-slingers, also can be used advantageously to ram up drags, copes, or even entire molds made from unmounted patterns. What is true of ramming up flasks applies even more to the production of cores, which can be made economically on machines in a very wide range of sizes.

In choosing various types of equipment, it is important that machines should be selected which will suit the conditions to be encountered. In completely mechanized shops, for instance, it is vital that a proper choice be made between the various available machines, so that the equipment installed will ram up the sand, draw the pattern and deliver the mold to the finishers in the least possible time, and in the best possible condition. It is, however, quite as important that the machines chosen for jobbing foundry work should be those best suited to the wide variety of patterns they usually have to handle. It is not intended in these pages to cover in full detail all the types of molding machines available today, particularly the more specialized ones designed for high production work. What is attempted here is to give a description of the main types, and to explain in broad outline the reasons that make each suitable to the classes of work for which it is most often used. Naturally, to accomplish this purpose, it is necessary not only to point out the strong points of each type, but to indicate the respects in which they fall short of the ideal.

The old-time skilled molder who knew his business could be depended upon to ram up a mold in such a way that the sand was compacted properly throughout, paying particular attention to any places where the shape of the pattern required ramming at an angle with the vertical. At overhanging portions of the pattern, such as are formed by loose pieces, the sand would be tucked in carefully and sometimes rammed horizontally with small rammers or the handle of a mallet. The molding machine, on the other hand, can for the most part compress the sand only in a vertical direction. Moreover, sand mixtures suitable for steel foundry molds do not possess sufficient "flowability" to move much in a horizontal direction, when pressed or jolted straight down. Therefore, a machine does not compact the sand under overhanging parts of the pattern as a good hand molder would do. For that reason a pattern for machine molding must be so designed that there are no hard-to-ram places, loose pieces for instance, being replaced by cores and core prints, or the operator must supplement the action of the machine by doing a certain amount of tucking and ramming by hand. An attempt is made here to point out the conditions, in the use of the several types of machines under which these precautions are necessary.

Machines used today to ram sand molds and core boxes are divided into two general classes; those in which the sand is delivered loose to the flask or core box and then compacted, and those that compact the sand as it is placed. Machines of the former type include squeezers, which force the sand against the pattern by steady pressure, jolters which compress it by repeatedly raising pattern, flask and sand a few inches and dropping them against a stop, and jolt-squeezers, which do both. Those that compact the sand as it is placed include slingers and core blowers. The former are provided with a device that receives sand from a feed belt in successive small handfuls and hurls it into a flask or core box with sufficient velocity to pack it tightly, the throwing device operating so fast that the sand appears to be delivered in a steady stream. Core blowers take the sand from a hopper and shoot it into a core box by means of a blast of compressed air, filling the box in a matter of seconds.

In making up a mold, either by hand or by machine, the parting naturally must be in a line with the edge of the flask. Therefore, in operating a squeezer, the flask must be set on the pattern board, or board and flask must be mounted on a rigid base to maintain their relative positions while the sand is compacted. It is obviously not possible to press the

Fig. 4—Small squeezer operated by hand

Fig. 5—Metal strips on flask edge hold sand in place

pattern board and pattern up into the flask, but instead the sand must be rammed by means of a plate called a squeezer head that fits inside the flask and presses down on the sand in it. Whether the squeezer head or the flask is moved, or both, does not alter the fundamental fact that the sand in these machines is compacted the most where it is in contact with the squeezer head and least where it meets the pattern.

When pieces of comparatively simple shape are made in shallow flasks or core boxes, the variation in degree of ramming between top and bottom is not so great, and a satis- (*Please turn to page* 186)

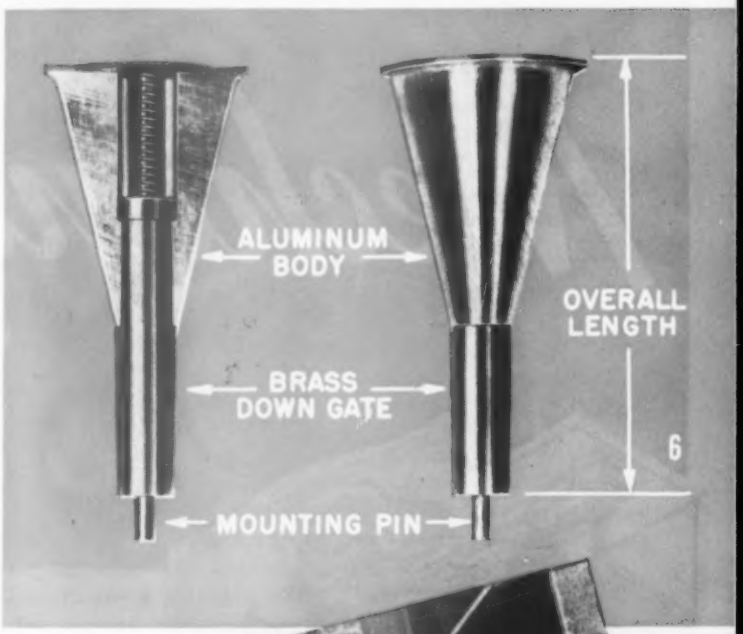


Fig. 6—Body of sprue or gate stick squeezes down and pops up when squeezer board is removed

Fig. 7—Sketch of spring-type gate stick

Fig. 8—Sketch of sliding type gate stick

Fig. 9—Lifting cope mold from matchplate

Fig. 10—Floor of snap-flask molds

Mechanized Units

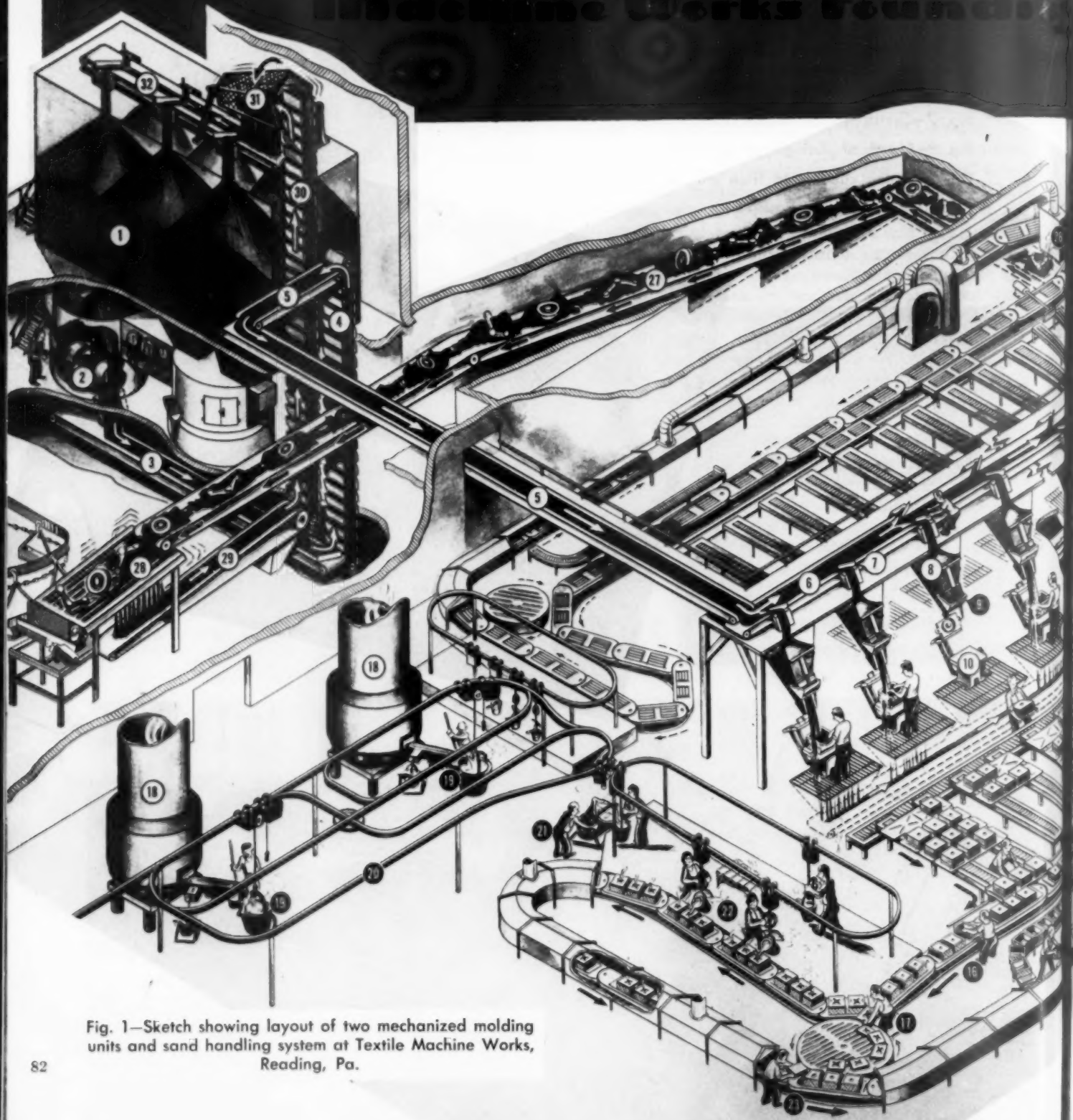


Fig. 1—Sketch showing layout of two mechanized molding units and sand handling system at Textile Machine Works, Reading, Pa.

FOUNDRYMEN are frequently reminded of the fact that castings are essential to the production of all manufactured articles. For the uninitiated layman who fails to grasp the need for castings in producing, for example, the sheerest of women's hosiery, the Textile Machine Works, Reading, Pa., offers a perfect illustration. This company, along with the Berkshire Knitting Mills and the Narrow Fabric Co. comprise the Wyomissing Industries of Reading's attractive suburb, Wyomissing, Pa.

Products of Textile Machine Works are indicated by its name; among the most important of these products are the Reading full-fashioned knitting machines used not only in the nearby buildings of the Berkshire Knitting Mills, but also by most other hosiery manufacturers in this country and throughout the world.

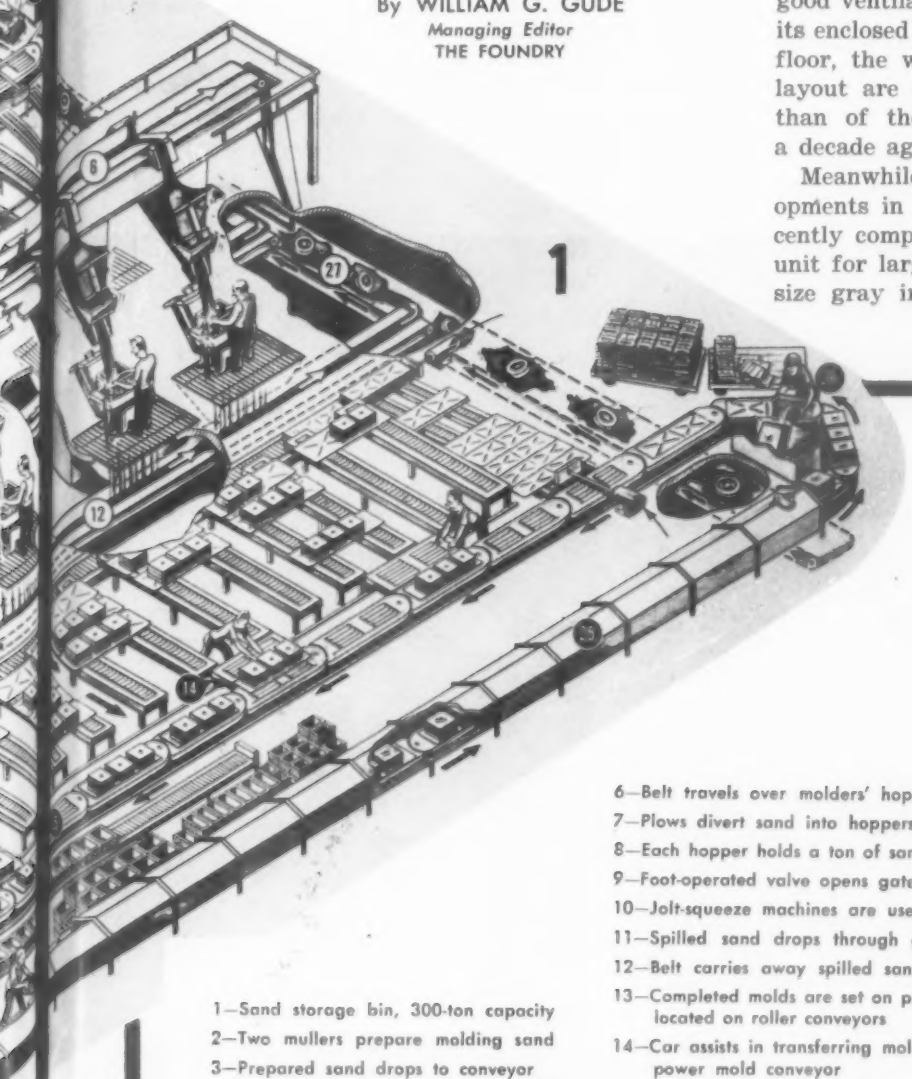
Textile Machine Works started to make gray iron castings about 1900, the decision to add this department to its existing machinery building facilities having been prompted by the need for high quality and accuracy in the castings from which so many of its knitting and braiding machine parts were made both then and now. The foundry department grew steadily, adding brass and aluminum castings to its production and devoting a part of both its ferrous and nonferrous casting capacity to outside jobbing business. Extensions and plant additions constantly became necessary to house the required foundry facilities.

About twenty years ago THE FOUNDRY described what was then—and still is—claimed to be the largest foundry in the world under one roof. This was Textile Machine Works' new foundry, a vast building providing more than 300,000 square feet of floor space. For the benefit of those preparing to dispute this "world's largest" title it might be pointed out that, while the stock yards of some large foundries are not located indoors, the enclosed area which comprises the storage for sand, pig iron, scrap, coke and other raw materials at the Reading plant could alone house a foundry of no small capacity.

In several respects the Textile Machine foundry was unusual for the period in which it was built; certainly the excellent illumination provided by its high windowed walls and numerous monitors, the good ventilation, comfortable wash and locker rooms, its enclosed raw material storage and cupola charging floor, the wide gangways and general roominess of layout are more typical of today's newer foundries than of the average so-called modern foundry of a decade ago.

Meanwhile the company has kept pace with developments in foundry practice and equipment, and recently completed installation of a highly mechanized unit for large-scale production of small and medium size gray iron castings. It is this new installation

By WILLIAM G. GUDE
Managing Editor
THE FOUNDRY



1—Sand storage bin, 300-ton capacity
2—Two mullers prepare molding sand
3—Prepared sand drops to conveyor
4—Bucket elevator lifts sand
5—Sand distributing conveyor
6—Belt travels over molders' hoppers
7—Plows divert sand into hoppers
8—Each hopper holds a ton of sand
9—Foot-operated valve opens gate
10—Jolt-squeeze machines are used
11—Spilled sand drops through grate
12—Belt carries away spilled sand
13—Completed molds are set on pallets located on roller conveyors
14—Car assists in transferring molds to power mold conveyor
15—Mold conveyor travels at 25 fpm
16—Jackets are placed on molds here
17—Mold weights are received via a turntable from other side of loop
18—Two cupolas supplying hot metal operate on alternate days
19—Metal is tapped continuously
20—Bull ladles move over monorail
21—Transferring to pouring ladles
22—Molds are poured as they travel
23—Weights being lifted from molds
24—Mold jackets are removed here
25—Ventilated hood eliminates gases
26—Molds are dumped from pallets through floor to underground conveyor
27—Apron conveyor takes castings under the floor to shakeout
28—Castings are transferred at shakeout to tray conveyor for delivery to the central cleaning department
29—Used sand from shakeout passes over magnetic pulley here before being returned to the central system
30—Bucket elevator picks up sand
31—Rotating screen breaks up lumps and removes foreign material
32—Belt distributes sand in bin

with which this article is primarily concerned.

General features of the mechanized lines are apparent in the accompanying layout sketch (Fig. 1), which is reproduced here through courtesy of Wyomissing Industries' monthly publication *The Yarn Carrier*. The layout comprises two molding lines served by individual pouring stations and power mold conveyors. Dividing the capacity in this manner provides more flexibility in adjusting operations, when necessary, than would be possible if the two units were combined into one.

Only seven molding stations appear in the sketch, but unit No. 1 actually has 15, which are faced by the 12 stations of unit No. 2. All of the stations are equipped with jolt-squeeze machines doing match-plate work, and receive sand from individual 1-ton capacity overhead hoppers which are supplied by belt conveyor from the central sand system. Hopper gates are actuated by a foot-operated valve, and spilled sand drops through floor grates onto an underground conveyor for return to the system.

Castings averaging about 7 pounds in weight and aggregating up to approximately 90,000 pounds a day, are made in a variety of sizes in the mechanized department. The number of pattern changes on individual machines may range up to nine daily, and a week's operation may involve as many as 170 different patterns on the two lines. Flasks employed are the pop-off type in 10 x 16 to 13 x 20 inch sizes.

Completed molds are placed on light-weight aluminum pallets conveniently available to the operators from a return roller conveyor. These pallets (Fig. 2), which are easily handled by one man, hold three molds each, and when loaded are pushed over gravity rolls to the power conveyor line. There they are transferred by means of a transfer car (Fig. 3), the operation being simplified by rolls on both the transfer and conveyor cars. Each car of the conveyor train, which travels at about 25 feet per minute, accommodates one pallet load of molds.

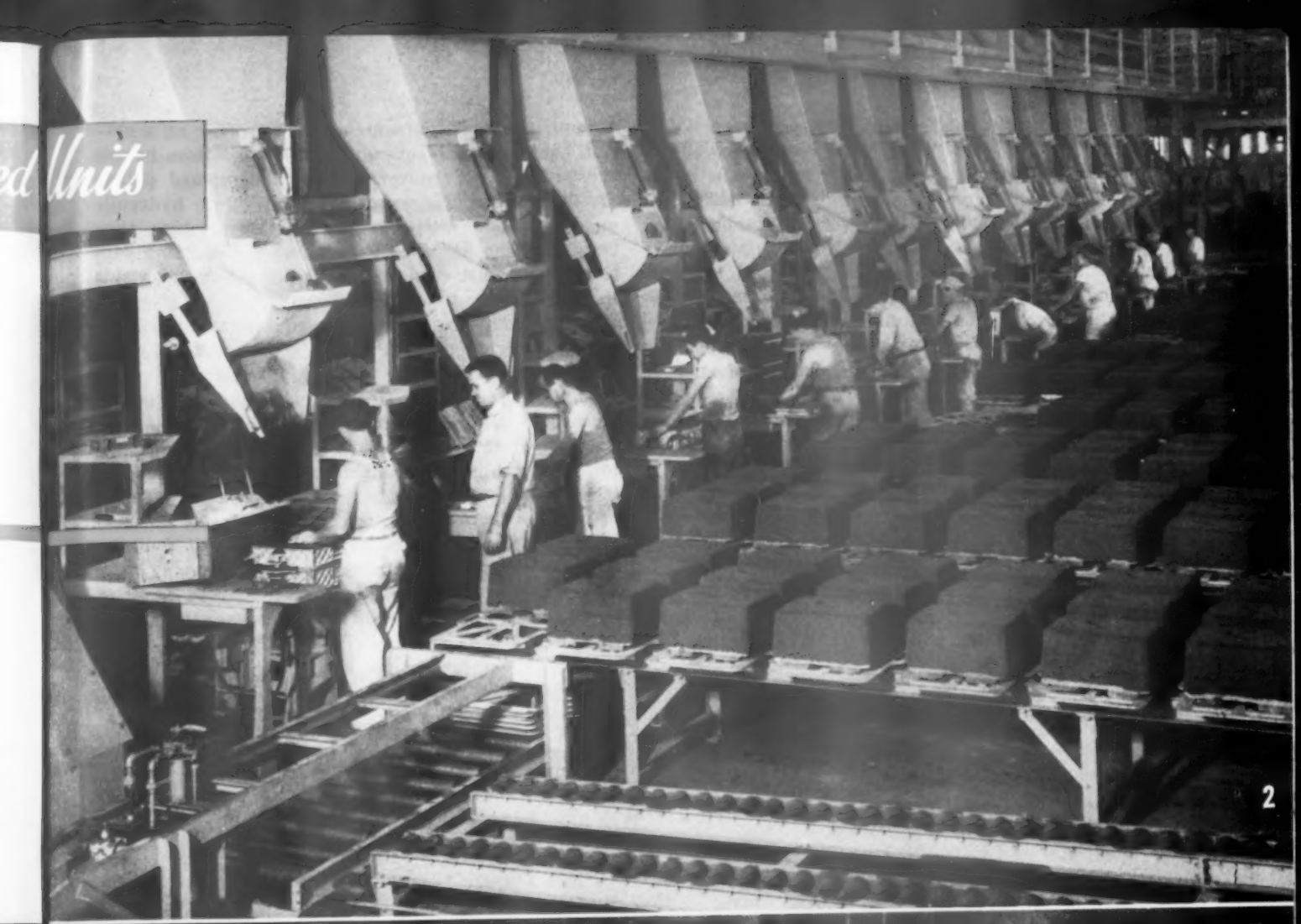
Before reaching the pouring station each mold is jacketed and weighted. The turntable shown in Fig. 4 facilitates the return of mold weights from poured

Mechanized Un

Fig. 2—Twelve molding stations of one unit face 15 stations of the second unit. Each is served by individual power mold conveyor to which molds move on pallets over roll conveyor lines

Fig. 3—Transfer car assists in moving loaded pallets onto power conveyor

Fig. 4—Mold weights removed from poured molds at right are moved on turntable to operator at left for reuse on molds about to be poured


ed Units
2

4

molds to those about to be poured. It will be noted that the height of the turntable in relation to the top of the mold is such that the operators are required to lift the weights only slightly in moving them from table to mold or vice versa. Handles at each end also assist in transferring the weights.

Hot metal is brought to the pouring stations in 2000-pound capacity insulated bull ladles over a monorail, and there it is transferred to 200-pound capacity pouring ladles. The pouring platforms, each served by four operators, are provided excellent ventilation and illumination, as evidenced by Fig. 5; and since the molds move immediately into a tunnel on leaving the pouring area, there is a noticeable absence of smoke and fumes resulting from this operation. The mold conveyor tunnel extends to the dump-out station, except for two openings where weights and jackets are removed. As shown in Fig. 1, one of the conveyor lines is longer than the other, and heavier work requiring a greater cooling period is handled on the longer line.

On emerging from the tunnel the molds are dumped through the floor onto an apron conveyor at a station equipped with an exhaust hood. Bottom boards are collected for return to the molders, and pallets are shoved off the conveyor cars by a hydraulic pusher onto a roll conveyor line over which they travel to another line paralleling the molding stations. A similar pusher moves the pallets down this line to the individual stations.

Sand and castings are carried beneath the floor prior to arriving at the central shakeout (Fig. 6) located near the sand preparation unit in a room adjoining the molding floor. This shakeout, elevated above the floor, is effectively hooded and ventilated. Castings from the shakeout screen drop onto a vibrator chute which automatically feeds them to a constantly moving tray conveyor. As each tray comes in position before the chute it closes a switch which starts up the vibrator. Castings are deposited as the conveyor continues to travel, and the moving tray automatically shuts off the vibrator as it is about to move away. Each succeeding tray repeats this operation.

Mechanized Units

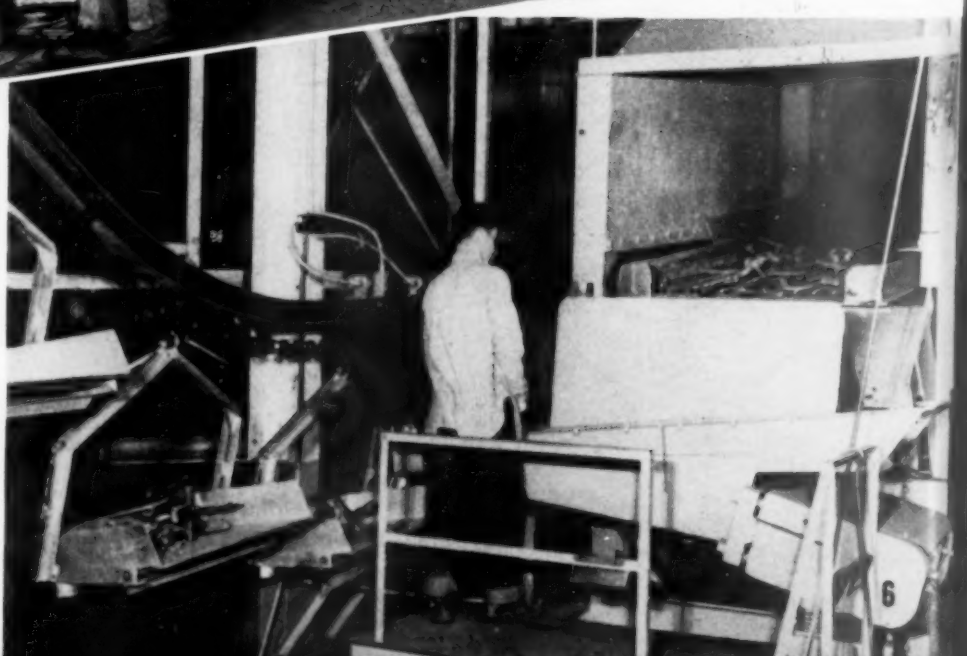


Fig. 5—One of the two pouring stations. Exhaust hood draws off smoke and fumes

Fig. 6—Shakeout discharges castings onto vibrating trough for deposit on tray conveyor leading to cleaning department

Fig. 7 — Mechanical charging unit serves the two cupolas which supply hot metal to the mechanized foundry

Fig. 8 — Coke is brought up to charging floor in skip hoist and dumped into cupola charging bucket

The tray conveyor takes the castings to the central cleaning department located in the opposite end of the building. There a variety of equipment is employed for cleaning castings produced both by the mechanized units and in the other molding departments. Cleaning equipment includes a blast room, airless blast tables and barrels, as well as floor stand grinders.

Sand from the shakeout drops to a conveyor belt, is passed over a magnetic pulley for removal of tramp iron and then is lifted by bucket elevator to a rotary screen where lumps are broken up and remaining foreign material is separated out before the sand is deposited in a 30-ton capacity storage bin. As required by the two large mullers located directly below, sand is drawn from the bin, mixed with accurately measured quantities of water and clay in 3500-pound batches and discharged to an underfloor belt. The latter leads to a bucket elevator which supplies an overhead belt conveyor system serving the molders' hoppers. Manually operated plows divert the sand into the hoppers as needed.

The synthetic molding sand mixture is checked frequently to maintain the plant's standard specifications of 3 to 3.5 per cent moisture, 10 to 12 pound green compression strength and 30 to 35 permeability.

Molten iron is supplied by two 78-inch cupolas lined to 54 inches. The cupolas, operated on alternate days, are the front slagging type and are tapped continuously at the rate of about 9 tons per hour. This provides a daily melt of about 65 tons, the tapping schedule being from 9 a.m. to 5 p.m. with a half-hour shutdown at noon. A tilting reservoir at the end of the cupola spout permits intermittent filling of transfer ladles.

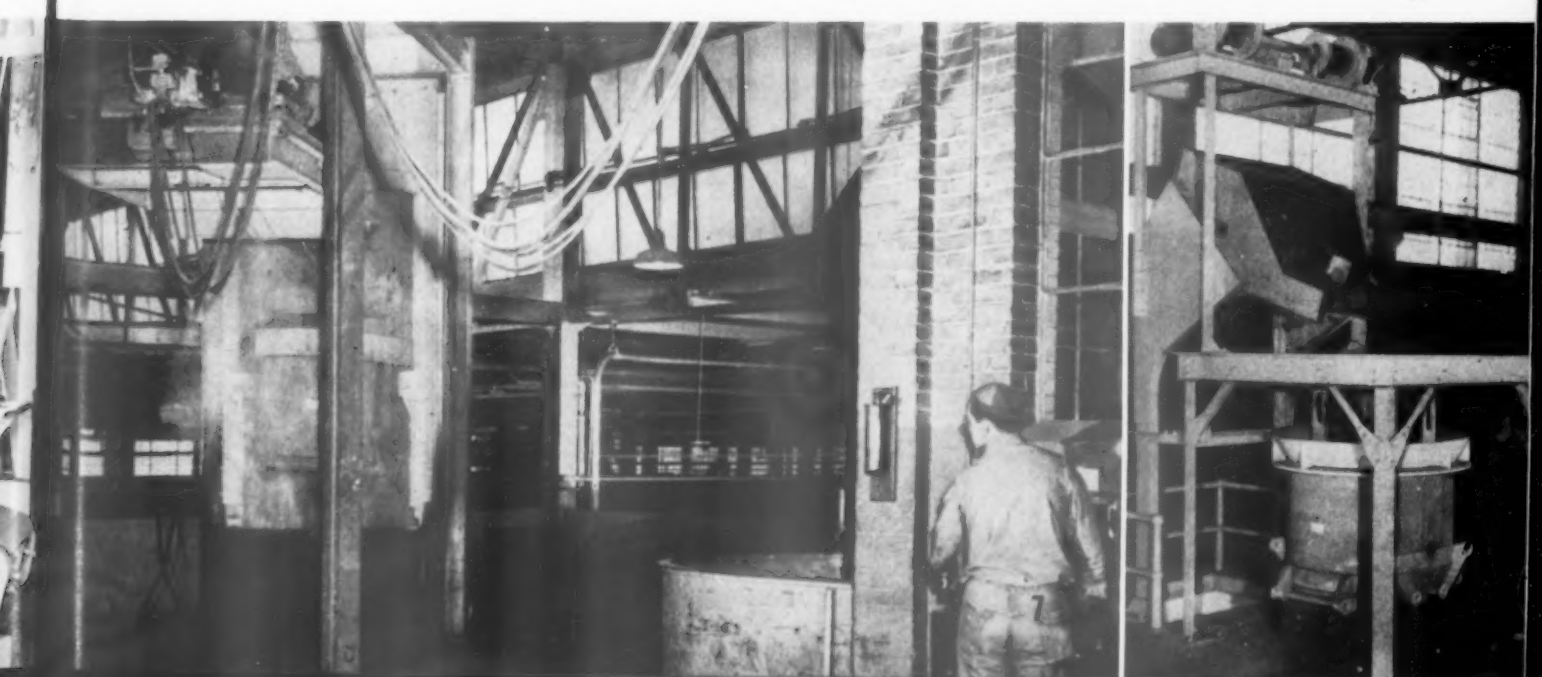
Extent of mechanization in making up charges and in charging the cupolas matches that in the molding department. Pig iron and scrap are stocked in a connecting building on the same level as the charging floor. This building is served by a railroad spur track, and an overhead crane equipped with magnet facilitates unloading of cars as well as making up of cupola charges. Pig iron and scrap are placed by crane in a weigh hopper until the required weight of metallics is registered on the scale; the load then is dumped into a drop-leaf charging bucket placed below the platform. A lift truck is employed to haul the bucket to the nearby charging floor where it is transferred to the mechanical charging unit. The latter is operated by remote control, as shown in Fig. 7, depositing the charge in whichever of the two cupolas is in service.

Coke and limestone are stored in the area below the metal storage floor, and individual charges are first weighed there before being brought up to the charging floor by a skip hoist to be dumped directly into the charging bucket, as shown in Fig. 8.

Sand is also stored in ground-floor concrete bins below the charge make-up floor. Both coke and sand are received in freight cars over the spur track above and are easily dumped through the floor to their respective bins. Core sand is mixed on this lower floor and hauled in large hoppers by lift truck to the coreroom. Coremaking involves bench and floor work in addition to machine blowing and is carried on in an area on the opposite side of the building from the mechanized units. Five oil-fired ovens of the rack type are employed for core baking.

The mechanized molding units replaced the former arrangement of setting molds out on the floor for pouring, with no central system for sand distribution. A few molding machines for miscellaneous work still are employed in this manner when it is not desirable to place the jobs on the lines. A considerably larger amount of floor space is devoted to floor molding of the larger castings required for various types of textile machinery. Such castings range up to 500 pounds in weight. Motive type sandslingers are used extensively for floor molding.

Nonferrous castings production is carried on in an area on the opposite side of the building from the gray iron floor and involves both aluminum and copper-base alloys. Melting equipment includes four 350-pound capacity electric furnaces and three gas-fired crucible furnaces—two of 150-pound capacity and one 1000-pound unit.



Effect of A

Aluminum-o

DURING the recent war the inherent engineering advantages of aluminum alloys resulted in an unprecedented demand for their application in castings and in wrought products. The tonnages required far exceeded the supply, and every pound of available aluminum, regardless of composition, was pressed into service.

The nature of aluminum metallurgy made it more practical to utilize the tremendous tonnage of available miscellaneous commercial scrap for casting alloys than for wrought alloys. It was therefore possible to reserve the critical supply of cell aluminum and segregated mill scrap for the production of wrought alloys and for those casting alloys whose mechanical and chemical properties could be impaired by relatively small quantities of certain alloying elements.

The need for a group of general purpose casting alloys that would utilize this scrap and would also satisfy the moderate engineering requirements for a host of castings led to a series of investigations by both producers and consumers of aluminum ingot. The studies soon revealed the fact that the available scrap limited such alloys to compositions of the aluminum-copper-silicon type. The copper had to be in the 4 per cent range because of the predominance of duralumin and of castings containing 4 per cent or more copper. Silicon could be readily alloyed to

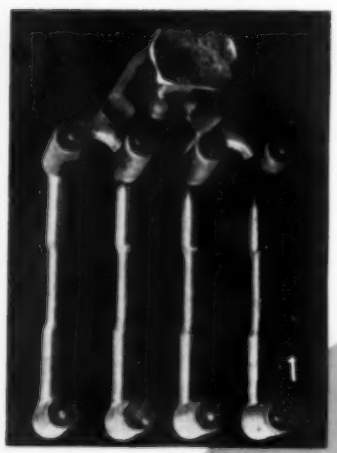
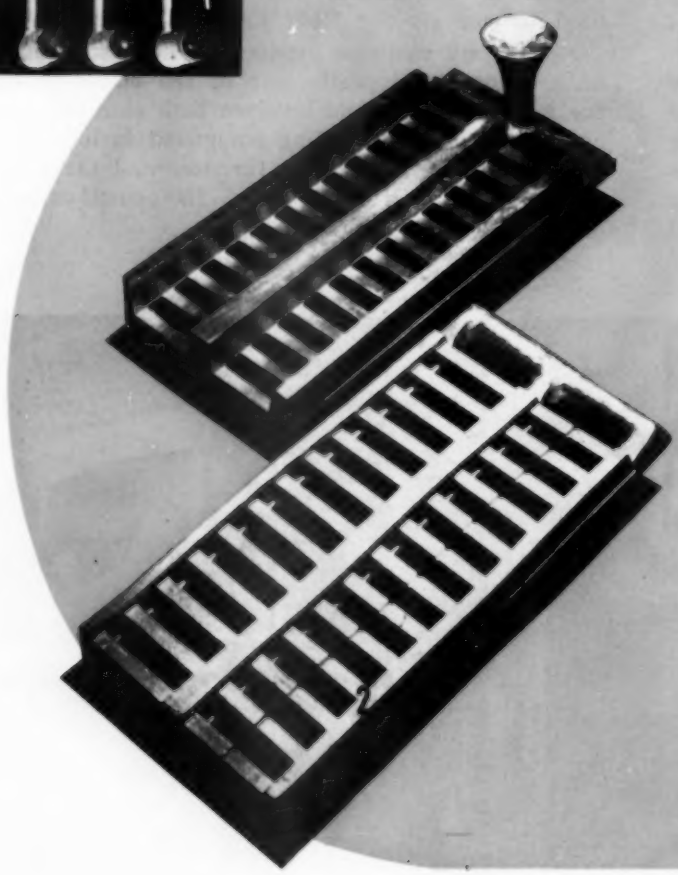
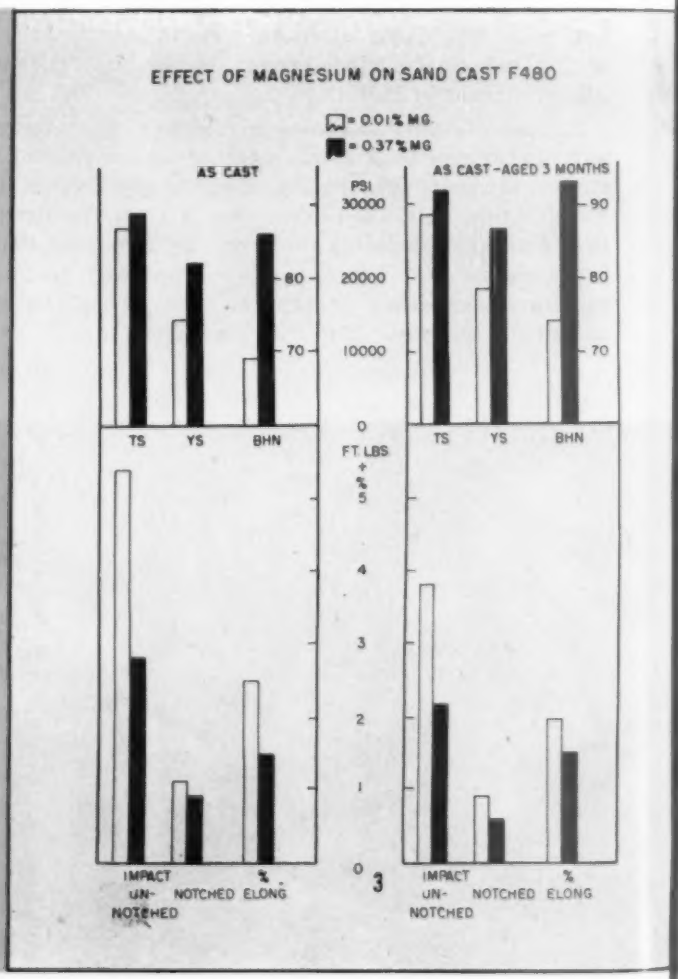


Fig. 1—Sand casting used for cast-to-size tensile bars. Fig. 2—Sand casting for producing cast-to-size Charpy impact specimens, notched and unnotched. Cope view at top, drag view at bottom. Fig. 3—Effect of magnesium on sand cast F480. Fig. 4—Effect of magnesium on chill cast F480. Fig. 5—Effect of magnesium on sand cast F460





By R. A. QUADT
Assistant Manager, General Aluminum Department and Research Metallurgist
and J. J. ADAMS
Research Metallurgist
Federated Metals Division
American Smelting & Refining Co., New York

# of Magnesium on . . . .

m-Copper—Silicon Casting Alloys

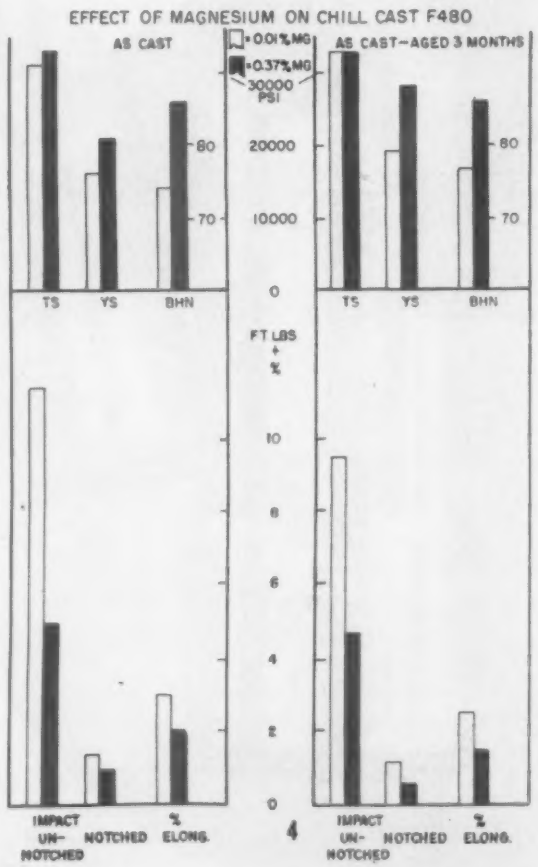
impart the desirable foundry characteristics of increased fluidity, increased pressure tightness, and reduced tendency to hot short cracking. (Silicon generally was added until 3 to 8 per cent was present.)

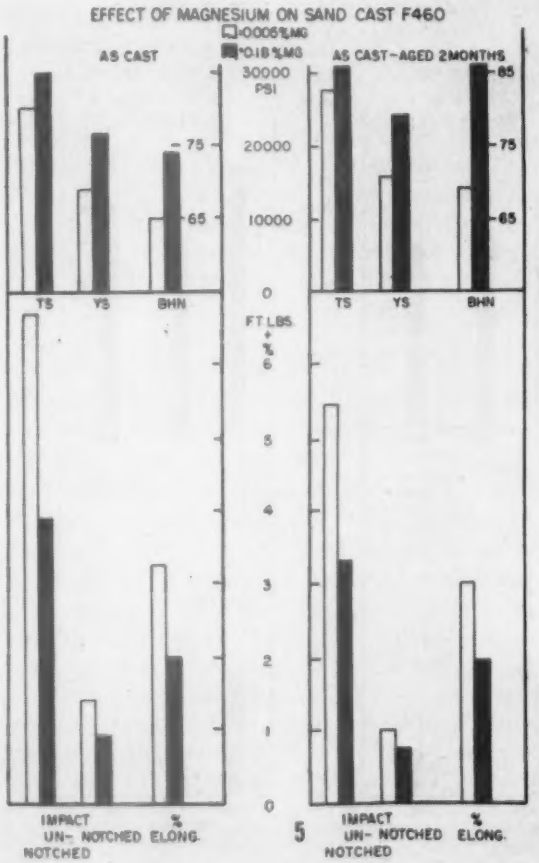
The effects of other minor alloying elements such as iron, zinc, manganese and nickel were also investigated. It was found that they do not greatly influence the properties within the commercial limits that could be held.

It was soon noted, however, that magnesium exerted a marked effect on the mechanical properties of this group of alloys. Elongation and impact resistance were found to suffer severely when only a few tenths of 1 per cent magnesium were present. The magnesium largely combined with the silicon to form the brittle magnesium silicide intermetallic compound. Embrittling effects resulted.

Although the castings produced from these general purpose commercial alloys were required to satisfy only nominal strength properties, it was considered desirable that they also possess moderate resistance to impact or shock loading. Since on aluminum casting alloys a rough comparison of impact strength can be gleaned from tensile elongation values, minimum elongation requirements were soon set by government procurement agencies.

To exceed safely the *minimum* elongation requirements of 1.5 to 2 per cent required under these specifications, investigation proved that magnesium must be reduced to low values. Some specifications on these alloys limited magnesium to 0.05 per cent





maximum while none permitted over 0.1 per cent.

W. E. Martin[1] has presented some results of work conducted on this type of alloy by the Sperry Gyroscope Co. He reported magnesium to be the most harmful impurity present in the alloys investigated and only alloys with magnesium under 0.10 per cent were considered usable for Sperry's purposes.

As a result of the restrictions placed on magnesium in these alloys, foundrymen and engineers became educated to the deleterious effect of this element on impact strength. This attitude has largely carried over into the postwar years. Considerable pressure has since been exerted, however, to encourage the use of alloys containing higher magnesium with the same amounts of copper and silicon.

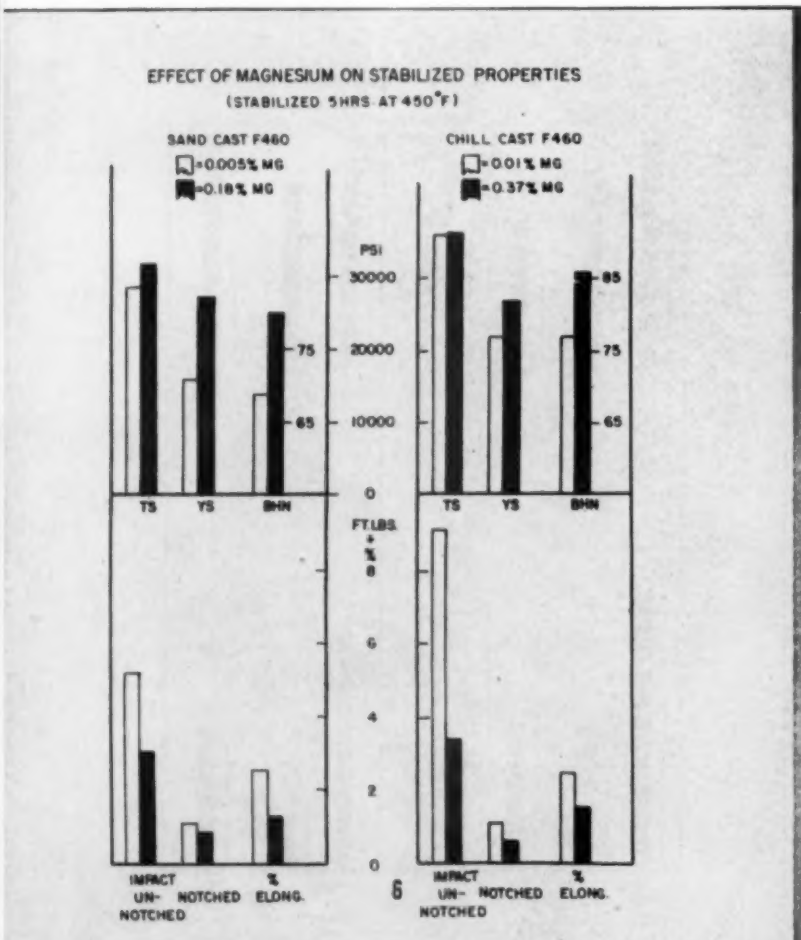
There are several reasons for this trend. In the first place the overwhelming percentage of available aluminum scrap contains high magnesium (averaging 0.3 to 1.4 per cent) and it is simpler and cheaper to produce alloys containing it. Secondly, many of the available metallurgical processes for removing magnesium from molten aluminum are relatively time-consuming and expensive.

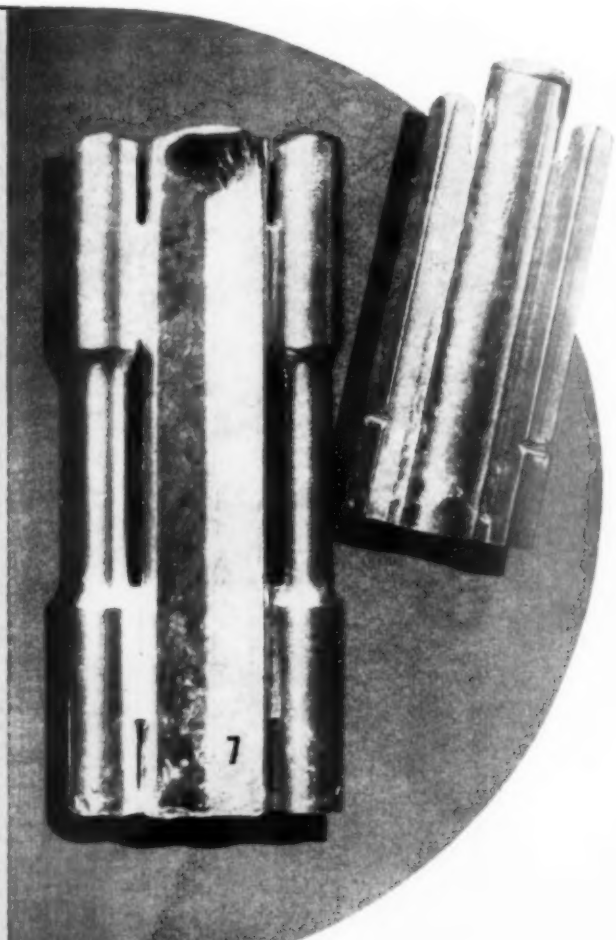
From an engineering viewpoint, an excellent argument can be presented in favor of the higher magnesium content alloys. The small magnesium additions markedly improve the proportional limit, the yield strength, hardness, and to a lesser degree, the ultimate strength — obviously desirable achievements. However, often unappreciated or overlooked is the fact that proportionate reductions in ductility, and especially in impact strength occur simultaneously. The ability of a casting to resist impact and shock loads is impaired.

Many foundrymen and designers have had the unfortunate experience of learning that certain castings became embrittled and failed after being in service for a relatively short time. This was particularly common when the older, high-copper, No. 12 type of alloy was used. The many variations of this alloy, often containing considerable silicon and magnesium, were all quite brittle (elongation 1 per cent or less). Unfortunately, it was often specified for the wrong applications because impact resistance requirements were either unknown or ignored. Often castings were required only to resist cracking upon being dropped to the floor, but even this accidental shock often proved too severe, especially after aging for several months.

Aluminum casting alloys of the copper-silicon type with no magnesium are not considered highly shock resistant at best. They also age at room temperature (see Figs. 3, 4, 5), causing them to become harder, stronger, less ductile and (*Please turn to page* 240)

Fig. 6—Effect of magnesium on stabilized properties
Fig. 7—Permanent mold castings used to produce test specimens. Gate for Charpy impact specimens at right, gate for tensile specimens at left





AFS Convention

Technical Reports

Additional reports on technical sessions held during the recent annual convention of the American Foundrymen's Society in St. Louis are presented here. Reports on other sessions were published in the June issue

AN IMPORTANT phase of plant equipment provided the subject for an interesting technical session during the American Foundrymen's Society convention in St. Louis, when C. A. Barnett, president, the Foundry Equipment Co., Cleveland, discussed "Modern Foundry Core and Mold Ovens," at a meeting sponsored by the Plant and Plant Equipment Committee. James Thomson, Continental Foundry & Machine Co., East Chicago, Ind., presided, with E. W. Beach, Campbell, Wyant & Cannon Foundry Co., Muskegon, Mich., serving as co-chairman.

The speaker emphasized that no matter how carefully core ingredients are selected and mixed, and regardless of the coremakers' skill in making cores accurately from first class corebox equipment, there still remains the important problem of baking cores properly to provide uniform characteristics that can be duplicated day in and day out.

Mr. Barnett presented a comprehensive illustrated discussion, stressing that properly selected core baking and mold drying equipment is essential in the present day foundry to minimize casting losses, to increase output of castings, to economize on core oven fuels, labor, materials and to make more effective use of valuable floor space. To meet present-day need of dependable control application of convection or recirculating heating systems has been one of the most important developments in core and mold oven design. Gas is considered the preferred fuel, although various other fuels are being used successfully.

Illustrations were shown of shelf, drawer-type, portable rack-type, car-type, conveyor-type, pit-type, vertical, combination vertical and horizontal and single strand horizontal ovens. High-speed continuous mold drying ovens are said to economically dry molds previously requiring overnight drying in batch-type ovens. Portable mold dryers are available for pit molds and large floor molds which cannot be handled either in batch or continuous type equipment. Mr. Barnett concluded his talk with a word of caution regarding maintenance of modern core baking and mold drying equipment, urging regular check on fans, temperature controllers, lubrication of conveyor machinery, and inspection of combustion chambers.

Patterns Are Production Tools

A technical session sponsored by the Pattern Division was under the chairmanship of A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, with H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind., co-chairman. The first paper, "Information Needed To Produce Satisfactory Pattern Equipment," was prepared by R. G. Christensen, Wisconsin Pattern Works Inc., Racine, Wis., and was read in his absence by L. F. Tucker, City Pattern & Foundry Co., South Bend, Ind.

Mr. Christensen pointed out that information on molding, production requirements and rigging is required not only for building satisfactory pattern equipment but also for intelligent bidding. The information usually is obtained by the patternmaker in co-operation with the foundry in which the castings are to be produced.

In the discussion following presentation of the paper, it was generally agreed that to produce the most economical pattern equipment for a given casting, it is essential to know the shop in which that casting will be produced and the type of molding equipment to be used. Also, in the majority of cases, gates should not be an integral part of the pattern. Need for flexibility is apparent where patterns are to be used in jobbing shops, but this flexibility has also been found desirable in captive shops as well, because it may be necessary to use different alloys in pouring a casting and therefore different gating techniques will be required.

"Maintenance of Wood and Metal Patterns," prepared by A. Huebner of the Allis-Chalmers Mfg. Co., Milwaukee, was read in his absence by V. J. Sedlon, Master Pattern Co., Cleveland.

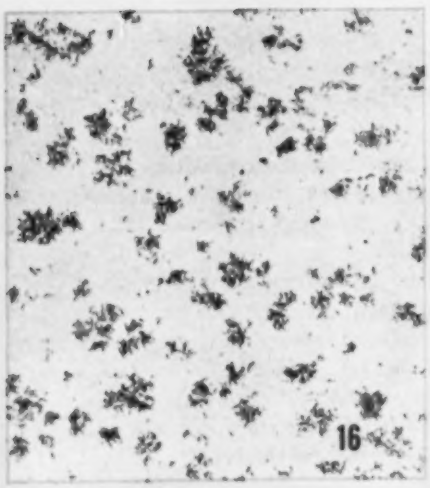
Mr. Huebner reviewed a case history of a set of wood patterns produced under the stress of wartime emergency conditions and the repairs necessary to keep the equipment in production. Mr. Huebner also stressed the necessity of proper handling and storing of patterns and contended that more damage is done by improper piling and careless handling in the foundries and pattern storage than is done by using the equipment. Also, since pattern equipment is the most important tool used in a foundry, personnel should be trained to handle and use it as an expensive tool.

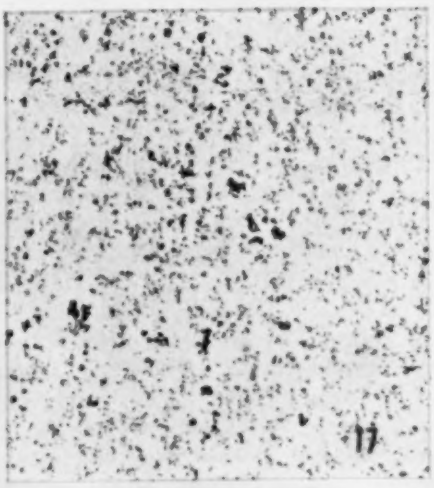
Mr. Pfeiffer stressed the importance of proper pattern storage in the subsequent discussion. Relating one instance in which (*Please turn to Page* 120)

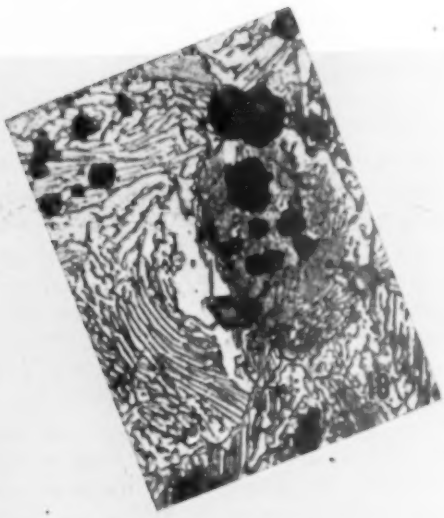
Graphitization

In the malleable iron process

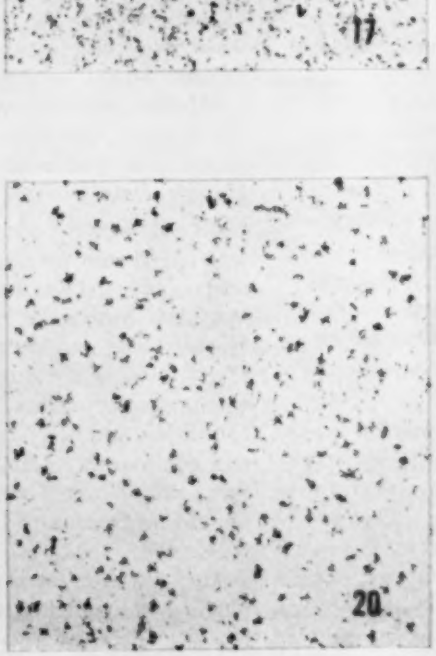
15


16


17



19


20

21

This further discussion of the graphitizing reaction in the production of malleable iron castings concludes the exchange paper of the Institute of British Foundrymen presented before the Association Technique de Fonderie

By H. G. HALL
Director
Castings Ltd.
Walsall, England

REFERENCE has been made (THE FOUNDRY, June) to the fact that graphite nodules are located at the cementite austenite interface. It would appear that the more numerous the interfaces the larger the number of graphite nodules per unit area in a given white iron. Many investigators have substantiated this point. Therefore, the finer the orginal white iron structure, the more numerous the nodules produced at the annealing temperature.

It is well known that thin sections graphitize much faster than thick sections of the same composition. The cooling rate from the molten state, therefore, governs the nodule number to some extent—but not entirely. Schwartz has indicated that for a given sample of white iron, the rate of heating to the annealing temperature influences the number of nodules formed. A slow rate of heating produces more nodules than a fast rate of heating. In fact, the author has observed in a previous paper[9] that a slow rate of heating between 400 and 600°C markedly increases the number of flake aggregate nodules in the compositions which he uses.

The nuclei appear to be established at very low temperatures during heating, a fact which appears to contradict frequent statements by investigators, to the effect that the higher the first stage annealing temperature, the more numerous the nodules.

The author finds by practical observations, under works conditions, that the higher the annealing temperature, the fewer the nodules, although they are obviously less compact.

It is agreed that if the annealing is carried out below the critical range, then the number of nodules is substantially lower than if the temperature used is considerably in excess of the critical range.

Further investigation is required to establish the precise effect of the annealing temperature on nodule number, when related to various rates of heating.

Pre-quenching—Another fact influencing nodule number, discovered independently by Schwartz[10] and Saito[11] in 1926, is that if a given piece of white iron is quenched from well above the critical range, and subsequently annealed, the number of nodules produced is many times that of the same iron annealed without the pre-quench treatment. The influence of prequenching is illustrated in Figs. 16 and 17.

Fig. 16 shows the nodule distribution in a sample of iron annealed at 900°C for 40 hours. Fig. 17 shows the same iron heated for 10 minutes at 900°C, then quenched and subsequently given 40 hours at 900°C. The vast increase in nodule number is quite apparent. It will be observed that the nodules are of the flake aggregate type. The same result is obtained in irons containing iron sulphide, which graphitize in the spherulitic form. Again, a prequench treatment produces upon subsequent annealing an increased number of very fine spherulites.

Fig. 18 shows the minute spherulites formed in a sample containing iron sulphide prequenched after 15 minutes at 900°C and annealed for 16 hours at 900°C. The magnification of this micrograph is 2000X.

The reason why a prequench treatment should so markedly affect the number of nodules formed upon subsequent annealing is so far not satisfactorily explained, although the work of Hultgren and Edstrom[12] is particularly interesting. These investigators studied the effect of increasing the temperature of the prequench, and of increasing the time at these temperatures. They indicate that the former increases the nodule number and the latter decreases it. It was concluded that for the compositions studied, times of 10 minutes and over at the prequench temperature were sufficient to start decomposition of the cementite, and that the consequent graphite nuclei governed the number of nodules obtained on subsequent annealing, regardless of the prequench treatment.

Hultgren and Edstrom, in a further experiment, quenched samples from the same temperature, into various media: oil, liquid air, molten lead—tin, and

Fig. 15—White iron heated in atmosphere of dry hydrogen for 100 hours at 850°C. (× 60)

Fig. 16—Annealed without prequenching. (× 60.)

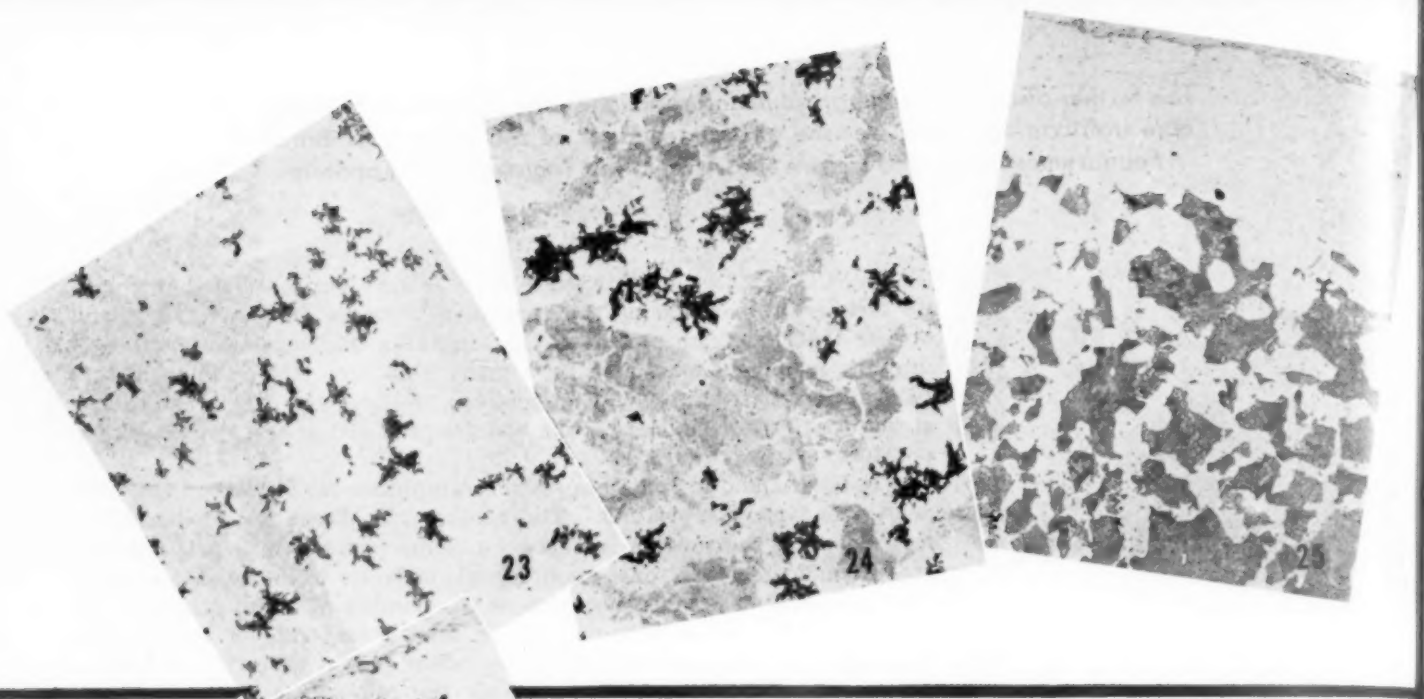
Fig. 17—Annealed after prequenching. (× 60)

Fig. 18—Minute spherulites in prequenched sample containing iron sulphide. (× 2000)

Fig. 19—No treatment. (× 60)

Fig. 20—Treated with aluminum. (× 60)

Fig. 21 Treated with tin. (× 60)



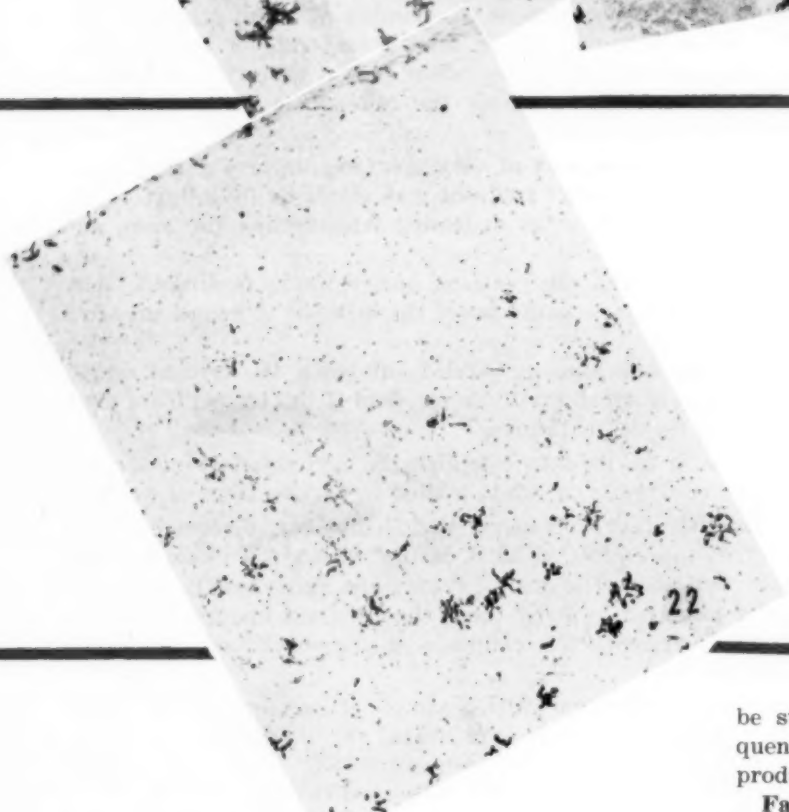


TABLE I—Analysis of Two Malleable Irons

	Produced from Pig Iron "A" (Dull Black Desirable Fracture)	Produced from Pig Iron "B" (Bright Crystalline Fracture)
Total carbon ..	0.93 per cent	0.89 per cent
Silicon	0.38	0.40
Sulphur	0.100	0.110
Phosphorus ...	0.086	0.086
Manganese	0.31	0.36
Nickel	0.01	0.01
Chromium	0.02	0.02
Molybdenum ..	0.01	0.01
Vanadium	0.01	0.01
Titanium	0.04	0.02
Copper	0.02	0.02
Aluminium	0.04	0.10
Tellurium	nil	nil
Boron	nil	nil
Calcium	0.005	0.005
Other metals ..	Absent	Absent
Gases		
Oxygen	0.0050 per cent	0.0062 per cent
Nitrogen	0.0070	0.0105
Hydrogen	2.80 ml per 100 grams	2.25 ml per 100 grams

molten lead. They concluded that the presence of some martensite in the prequenched structure is a necessary condition for the prequench treatment to have any effect.

Schwartz suggests that the formation of finely spheroidized cementite, when the prequenched iron is again heated, may result in many additional cementite austenite interfaces, thereby giving the opportunity for the formation of many more nodules.

In view of previous comments suggesting that flake aggregate nodules have a nucleus of manganese sulphide, and spherulitic nodules a nucleus of iron sulphide, it seems possible that the disturbance of the cementite austenite interface caused by the prequench treatment, may redistribute the sulphide particles present in those areas, into a state of subdivision.

There is as yet no evidence of this. It should also be stated that, so far as the author is aware, prequenching has not been applied to the commercial production of malleable cast iron.

Factors Affecting Nodule Number—Reference has been made to the possibility of sulphide particles behaving as nuclei for the deposition of two distinct types of nodule, and to the location of these nuclei at the cementite austenite interface. The importance of the rate of heating to the annealing temperature has been stressed, and a marked increase in nodule number due to a prequench treatment has been briefly dealt with.

There must be, however, other particles which operate as nuclei. The addition of aluminium in very small amounts is known to substantially increase the number of nodules formed. Similarly, additions of chromium, tellurium, antimony and tin reduce the number of nodules formed. Figs. 12, 20 and 21 show the nodule distribution in three irons, all of the same basic composition, all annealed at the same temperature for the same time. Fig. 19 shows the base iron with no addition, Fig. 20 the same iron plus 0.08 per cent aluminium prior to casting, Fig. 21 the base iron

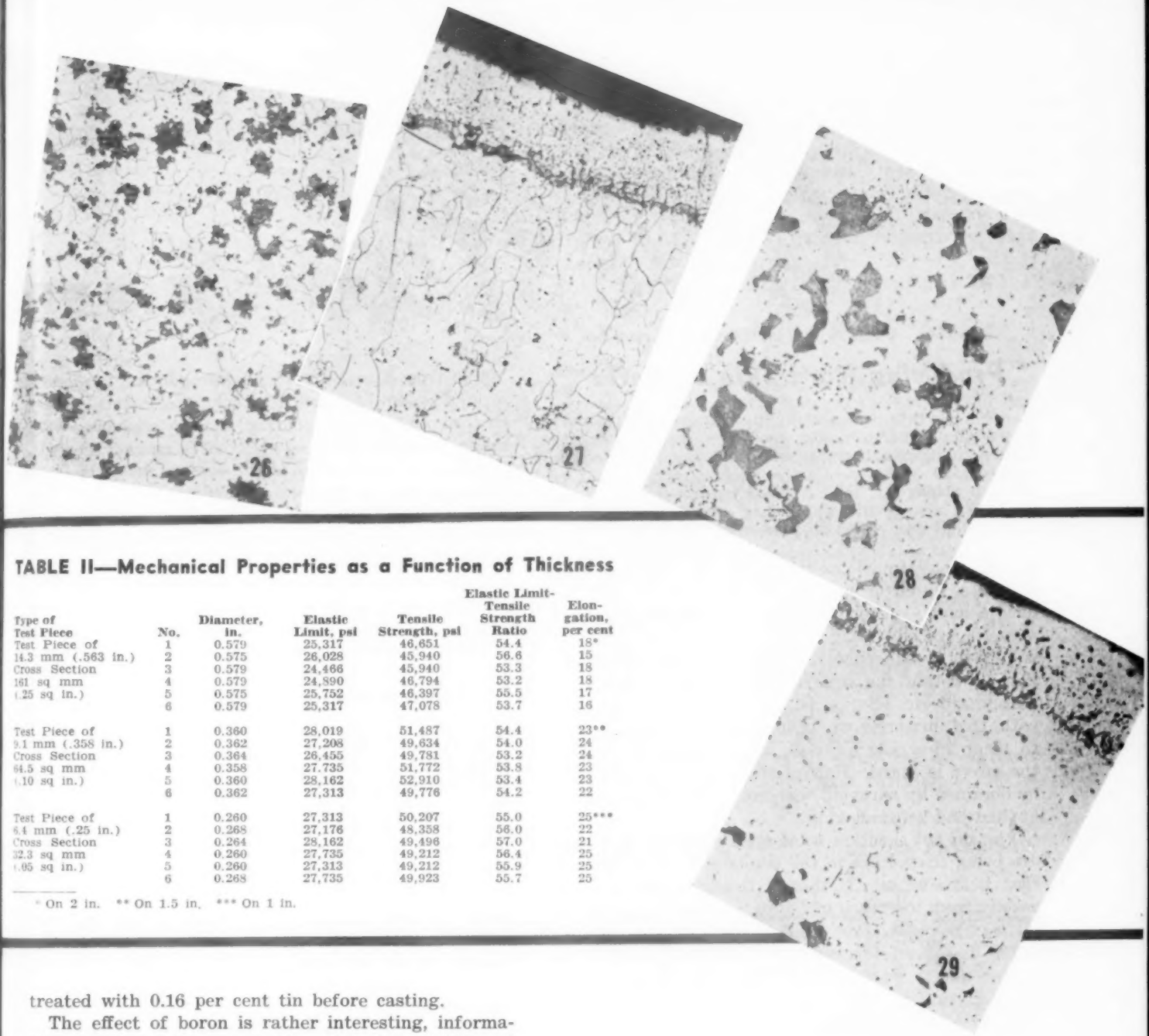


TABLE II—Mechanical Properties as a Function of Thickness

Type of Test Piece	No.	Diameter, in.	Elastic Limit, psi	Tensile Strength, psi	Elastic Limit-Tensile Strength Ratio	Elongation, per cent
Test Piece of	1	0.579	25,317	46,651	54.4	18*
14.3 mm (.563 in.)	2	0.575	26,028	45,940	56.6	15
Cross Section	3	0.579	24,466	45,940	53.3	18
161 sq mm	4	0.579	24,890	46,794	53.2	18
(.25 sq in.)	5	0.575	25,752	46,397	55.5	17
	6	0.579	25,317	47,078	53.7	16
Test Piece of	1	0.360	28,019	51,487	54.4	23**
9.1 mm (.358 in.)	2	0.362	27,208	49,634	54.0	24
Cross Section	3	0.364	26,455	49,781	53.2	24
64.5 sq mm	4	0.358	27,735	51,772	53.8	23
(.10 sq in.)	5	0.360	28,162	52,910	53.4	23
	6	0.362	27,313	49,776	54.2	22
Test Piece of	1	0.260	27,313	50,207	55.0	25***
6.4 mm (.25 in.)	2	0.268	27,176	48,358	56.0	22
Cross Section	3	0.264	28,162	49,496	57.0	21
32.3 sq mm	4	0.260	27,735	49,212	56.4	25
(.05 sq in.)	5	0.260	27,313	49,212	55.9	25
	6	0.268	27,735	49,923	55.7	25

* On 2 in. ** On 1.5 in. *** On 1 in.

treated with 0.16 per cent tin before casting.

The effect of boron is rather interesting, information from America suggesting that the addition of 0.001 to 0.004 per cent boron accelerates graphitization, increases the nodule number, offsets the effect of up to 0.1 per cent chromium and in general smooths out annealing difficulties.

Experiments in this country suggest that if boron is added as boron carbide, in amounts sufficient to add 0.001 to 0.01 per cent boron to the iron, graphitization is definitely retarded. If, however, boron is added as ferroboron, then the American claims are correct. Ferroboron is known to contain substantial amounts of aluminium, and it is believed that it is this element which is responsible for accelerating graphitization rather than boron.

Palmer has made an extensive investigation into the effects of residual or alloying elements. It is noteworthy that, in the main, second stage graphitization is far more influenced by the presence or addition of small percentages of special or residual elements, than the first stage decomposition of cementite.

Antimony, chromium, va- (*Please turn to page* 234)

Fig. 22—Surface of thin section, produced from pig iron A. (× 60)

Fig. 23—Center of thick section, produced from pig iron A. (× 60)

Fig. 24—Center of thick section, produced from pig iron B. (× 60)

Fig. 25—Edge of thin section, produced from pig iron B. (× 60)

Fig. 26—Center of low silicon, balanced manganese-sulphur composition annealed in decarburizing atmosphere. (× 60)

Fig. 27—Edge of structure illustrated in Fig. 26. (× 60)

Fig. 28—Center of balanced manganese—sulphur composition after drastic decarburization. (× 60).

Fig. 29—Edge of structure shown in Fig. 28. (× 60)

Questions AND A

Producing Hard Skin on Cores

Q.—We operate an aluminum foundry and understand that one can use molasses water, sulphite binder solution and water glass solutions to produce a hard skin on cores. Can you tell us the amount of dilution required? Is it applied before or after baking? We also would appreciate any information on a core sand mix which will not stick in the coreboxes.

A.—In many foundries the cores are sprayed with molasses water or sulphite binder solution to produce a hard skin on the cores. The dilution is about 1 to 10, but may vary from 1 to 5 to 1 to 20. You will have to experiment to determine the best dilution to obtain the desired results. Water glass or sodium silicate solution is used to some extent, and with that material we believe that a solution of 1 to 15 or 20 should be tried, with revision as soon as the effect is noted. Hard surface on cores also may be obtained by spraying with core oil. All sprays are applied just before baking.

You do not mention what type of binder you now are using that sticks in the coreboxes, but it appears that it is core oil. If that is the case, the sticking results from too much moisture, or possibly too much oil may be used. For small to medium castings you might try a mixture of 100 parts sand, 1 part oil binder and 1 part dextrin. For thin section cores the dextrin can be increased to 1½ parts. Moisture should be 3 to 4 per cent.

Has Trouble with Gassy Metal

Q.—We have been pouring some high-nickel bronze in our foundry and have been experiencing difficulty with gas holes in the metal. Do you have any information or literature as to what we may use with this metal to overcome these gas holes?

A.—By high-nickel bronze we assume you are referring to the nickel silvers containing 15 to 30 per cent nickel; with them a definite deoxidation and degasification procedure must be followed to eliminate any trouble from gas absorbed during melting. In the first place it may be advisable to check your melting unit to see that the alloy is melted down and brought up to temperature as rapidly as possible because the longer it remains in the furnace, the more gas is absorbed.

The following method of degasification and deoxidation should eliminate trouble from gas. First step is to add 1½ oz of 97 per cent manganese metal per 100 lb from 5 to 7 minutes before pouring by placing it in a paper bag and dropping into metal. Then 3 to 5 minutes before pouring add ¾-oz of pure stick magnesium per 100 lb of metal. The magnesium must be plunged under and held beneath the surface of the melt until it dissolves to obtain any benefit. One method of doing it is to take a piece of ¼ x 1-in. steel bar about 3 ft long, and bend one end around so it will hold the magnesium stick. The bar with the magnesium can be plunged to the bottom of the crucible and stirred beneath the surface. Just before pouring add 2 oz of 15 per cent phosphor-copper per 100 lb metal, and stir in well.

Information on Making Rolls

Q.—Can you give us any information on making chilled rolls? We have to make one with a 4¾-in. section with a chill of ¾-in. Is this possible, and what mixture should be used, etc.?

A.—As you undoubtedly know, a roll with a chilled face usually is produced by pouring the iron into a mold formed by a metal chill. Thickness of the chill generally is determined by dividing the roll diameter by 2 for rolls up to 30 in. in diam, and by 2½ over that. It is regrettable that insufficient information was given on the outside and inside diam of the roll as well as the length, but your question indicates that the roll is hollow with a 4¾-in. wall. If the core is not too large in relation to the wall thickness, it would appear that the chill thickness to be employed would be based on the relationship mentioned previously.

To obtain a chilled face on the roll, the iron is low in silicon content, and the greater the chill, the lower the silicon. So many factors enter into predicting the amount of chill that it is practically impossible to suggest a composition which will hit the nail on the head. Rollmakers determine the chill by means of test blocks which are broken to examine the depth of the chill. Through experience they know the relationship between chill in the test block and in the roll, and can adjust it by additions of ferrosilicon, ferromanganese, or ferrochromium or iron pyrites to the metal in the ladle before pouring; the silicon and manganese being chill reducers, and the chromium and pyrites (iron-sulphur) being chill raisers.

We would guess that the silicon content of 0.75 per cent would give the desired chill depth, but you will have to do some experimenting to determine the proper amount. Possibly you could arrive at a bet-

ANSWERS

ter value by casting some 4¾-in. square blocks against a heavy chill—in other words, simulate your roll problem on a small scale.

Solid rolls are gated through the bottom by a tangential runner which gives a circular or swirling motion to the metal coming up in the chill mold. This causes any dirt or dross to move to the center and be carried up with the rising metal, rather than lodging against the mold wall. Upper portion or neck of the mold is extended considerably above the desired length to serve as a riser. When the metal rises in the mold to the beginning of the neck, pouring through the gate is cut off, and hot metal is poured into the neck portion to obtain good feeding.

With a hollow roll, a ring of pop gates may be placed around the top, centrally located with respect to the outer and inner rims to insure that the metal drops straight down without impinging on either core or chiller. Length of the roll is extended, of course, to act as a riser. This method saves a great deal of molding time when it can be employed.

Determining Time for Cooling

Q.—We would like to know if there is any guide whereby a gray iron foundry can determine when sufficient time has been allowed to cool the casting after pouring.

A.—We do not know of any easy method for determining the cooling rate of gray iron castings. Bolton and others have pointed out that there is a relationship between volume-area (V/A) and cooling rate, and by establishing actual cooling curves for different size sections of the same composition poured at the same temperature as will be used in practice, graphs or curves may be developed for the relative cooling rates. Along this line it might be pointed out that Fifield and Schaum in a study of "Solidification Characteristics of Gray Cast Iron," presented at the recent AFS convention, concluded that:

The rate of solidification in a given section size varies inversely with the temperature above solidification temperature at which the metal is poured. Rate of solidification increases with decrease in cross-sectional area. Rate of solidification varies with chemistry; up to the eutectic composition, the higher the carbon, the lower the rate. Cast iron acts essentially as a solid after its temperature falls slightly below the liquidus; the tightly interlaced dendrites are able to hold their shape and support considerable weight of liquid metal.

Your attention also is directed to a paper entitled "Comparative Solidification Studies" by Paschkis, also presented at the AFS convention, in which he shows that the shape of the casting, at least as far as cast steel is concerned, has an important bearing on solidification. He indicates that a sphere, a cylinder and a slab of the same V/A ratio (3-in.) became solid at close to 80, 56 and 33 minutes, respectively, when poured at the same temperature (3049° F), and at about 60, 42 and 20 minutes when poured at 2862° F.

Tensile-Modulus Ratio Varies

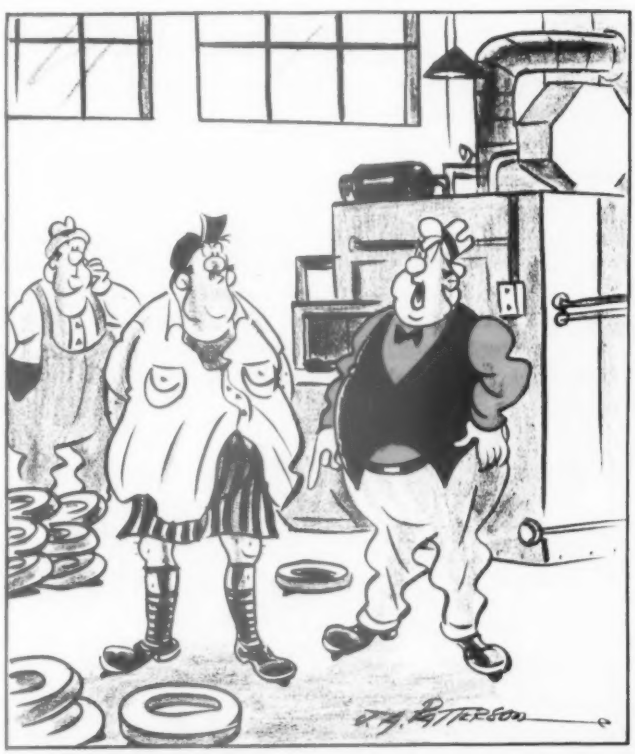
Q.—As a university student taking a course in physical metallurgy, we noticed in our laboratory work an ever decreasing ratio between the modulus of rupture and tensile strength of cast iron. Test data obtained are given in Table I, and are the average of several different tests. We would like to know why the ratio should vary and any sources of information on the subject.

A.—As you undoubtedly know, there is no relationship between the transverse load test and tensile strength of gray iron, and as an indication of that we have included a few figures taken from *Alloy Cast Iron,* presented as Table II. Here it may be seen that in five bars showing a tensile strength of 40,500 psi, the transverse load ranged from 2560 to 2960 lb, and consequently, the modulus of rupture from 54,591 to 77,528. Other tensile strength values with transverse load and modulus of rupture are given to show the wide range which can be expected.

You know also that the load carrying ability of

GANGWAY!

By J. A. PATTERSON



"Your absent mindness is getting worse every day—go back and put on your safety shoes!!"

Questions AND ANSWERS

the transverse bar is affected by its structure which in turn is related to cooling conditions and alloy additions. In a plain gray iron with a composition such as to result in a coarse grain structure with large graphite flakes under slow cooling conditions, the transverse strength will be low. However, the additions of certain alloying elements may increase the transverse strength without much effect on tensile strength. Also more rapid cooling conditions will cause an increase in transverse strength and in tensile strength, but not in the same proportion.

In transverse testing the whole bar is used, and includes the outer fiber where chilling effect is greatest, while in tensile testing, the interior of the bar is used, the outer portions being machined

TABLE I

Tensile Strength	Modulus of Rupture	MR/TR
20,000	56,400	2.82
25,000	64,200	2.57
30,000	71,900	2.39
35,000	79,800	2.28
40,000	87,600	2.19
50,000	100,450	2.09
60,000	120,000	2.00

TABLE II

Tensile Strength	Transverse Load	Modulus of Rupture	MR/TR
40,500	2960	77,528	1.91
40,500	2880		
40,500	2660		
40,500	2620		
40,500	2560	54,591	1.35
48,000	2970	78,794	1.64
48,000	2800		
48,000	2575	68,314	1.42
40,000	2680	71,100	1.78
40,000	2760	73,222	1.82
50,000	2720	72,162	1.44
49,000	2660	70,570	1.44
49,000	2560	67,917	1.38
33,000	2240	59,427	1.8

off. While it appears that your transverse load data are somewhat high, we note that, in comparison with the minimum values given in ASTM specification A-48, the difference in the ratio MR/TS for 20,000 and 60,000 psi is about the same; that is, for your data it is 0.82 while in the ASTM it is 0.85, and a comparison of the differences between each class or tensile strength is about the same for both. For further data on modulus of rupture you might check page 384 of the third edition of *Cast Metals Handbook*, and John W. Bolton's *Gray Cast Iron*, page 294.

Makes Abrasive-Faced Castings

Q.—Some years ago in one of the issues of THE FOUNDRY information was presented on the method of producing abrasive-faced sills or thresholds. Can you send us a reprint of that information, or supply us with the pertinent facts?

A.—Production of abrasive coated gray iron or nonferrous alloy castings requires skill and experience, as it is somewhat tricky. Essentially the procedure is to coat the mold face with some type of adhesive, which may be molasses water, thin claywash, sulphite liquor binder, a solution of bentonite in water with or without sodium silicate, sodium silicate solution, etc. It is preferable to spray the coating to obtain uniform thickness as well as to use the minimum amount.

Abrasive grit which usually is silicon carbide in 30 to 36 grain size, then is screened or sifted over the sticky mold surface in a uniform thin layer, employing a sieve or screen of the same mesh as the abrasive material. The abrasive layer should be thin, and it may be advisable to spray the first layer with adhesive and apply a second coat of abrasive. The coated surface then is torch dried sufficiently to drive the moisture away from the face so that the molten metal will lie quietly against it. Metal should be good and hot when poured so that it will penetrate between the abrasive grains and fuse to them.

Changing Diameter of Cupola

Q.—We have a cupola which is 84 in. diam lined down to 72 in. How much less coke would be required if we were to reline this cupola down to 60 in.—that is, put in another layer of brick or blocks inside the present 72-in. lining?

A.—Since the areas and volumes of circles and cylinders vary as the squares of the diameters, it is not difficult to determine the difference in quantity or percentage. To simplify calculations the respective diameters are taken in feet so that the respective squares are 36 and 25. The difference between those is 11 which is about 30.5 per cent of 36.

Longer method of computation which gives the same result is to determine the actual volume of a section 1 ft deep for each cupola which is 28.26 cu ft for the 72-in. and 19.63 cu ft for the 60-in. cupola. Difference is 8.63 cu ft which is approximately 30.5 per cent of 28.26 cu ft. Assuming a 6-in. coke split weighing 28 lb per cu ft, the 72-in. cupola would require slightly more than 395 lb coke while the 60-in. cupola would require slightly under 275 lb.

Pitted Surface on Plow Point

Q.—We are in the farm implement business and are having difficulty with our plow points coming dirty on the face. Points are cast on a chill face up in No. 2 Albany sand, no facing. Metal is poured around 2300 to 2500° F, and shows 1.70 to 1.80 per cent Si, and 0.388 per cent S. Molding is done on squeezers in pop-off flasks. Matchplates are gated in the cope. We have tried several types of gates without success. It is our opinion that the pits are caused by sand cutting from some place although sprue and gates are perfect and show no signs of cutting or washing.

A.—Since you are reasonably certain that the pitting on the plow point faces is caused by loose sand, the problem is to ascertain the source. As you indicate, the first place to look for disturbed sand is in the sprue and gates since they bear the brunt of the flow of metal. However, you state that they do not show any evidence of cutting or washing, but we wonder if you have made a careful examination of the mouth or top of the sprue. Often the molders cut away some sand at that point, but fail to press the

(*Concluded on page* 100)

GIVE 'EM A LONG VACATION

The New ROYER *Sand Conditioner is completely mechanized*

The new Royer does away with a back-breaking and time-wasting chore—*hand shoveling* in sand preparation! The new Royer is self-propelled and self-loading. It moves into the heap on its own power . . . loads sand onto a combing belt . . . automatically culls out burnt cores and other trash . . . combs, blends, aerates and discharges up to 50 tons per hour of finest quality molding sand.

Why not write us for complete details on this useful new foundry machine? It may be the means of a worth while saving on your production costs.

ROYER

FOREMOST IN SAND CONDITIONING EQUIPMENT

ROYER FOUNDRY & MACHINE CO.

159 PRINGLE ST., KINGSTON, PA.

Questions AND ANSWERS

(*Concluded from page* 98)

remaining sand down firmly. The cutting operation tends to disturb or loosen some of the sand and, if not pressed down, it is washed into the mold cavity.

Possibly your molding sand may be slightly on the weak side—that is, it requires a little more bond. You might try making a few molds with a thin facing of half new and half old sand, and see what results are obtained. If the trouble is eliminated, it will indicate that more bond is needed, and that can be accomplished by addition of new sand or one of the numerous bonding agents available. Again it may be that the sand is being worked a little too dry, and the standing period between the time the molds are made and poured is sufficient to permit some of the sand grains to be removed by the flowing metal. Still another possibility is the condition of the wash or coating placed on the chills. It may be dirty or lack sufficient bond to hold it firmly in place when struck by the molten metal. Possibly it may be put on too thick, and cracks off by the impinging metal stream.

Steam Is the Cause of Trouble

Q.—Under separate cover we are sending you a sample of gray iron taken from a defect we have encountered just under the surface of the cope side of a casting weighing approximately 3000 lb with a wall thicknes of 3 in. The castings are made in dry sand molds. Iron from the cupola is tapped into a heated mixing ladle and transferred into a 3000-lb crane ladle for pouring into the mold. This defect has shown up recently in a number of castings. We shall appreciate your opinion on the probable cause.

A.—The defect on the piece of gray iron scrap which accompanied your recent inquiry was caused by steam blowing through the iron to form a semiporous, slushy compound that floated until it came into contact with the cope face. Investigation will be necessary to find where the steam originates.

In some instances a wet spot in the mold or core may be the direct cause. In other instances lack of suitable vent passages in crucial areas will cause a certain amount of gas and steam to back up into the metal. Since your mold is dried and presumably properly vented, this item may be ignored. No mention is made of a core or cores, therefore this item also may be left out of the diagnosis.

The iron is tapped into a heated stationary ladle and then transferred to a pouring ladle. This ladle also is dry and hot. The iron is not agitated. It flows in a clean stream into the mold. However, occasionally, some of the lining material falls from the ladle lip. The attendant patches the spot with wet daubing material. Under a tight schedule the ladle man cannot wait for the patch to dry. He pours the metal over the wet patch. The result is the formation of one or more floating islands composed of iron, steam and possibly some eroded sand.

At this distance and without further particulars we are inclined to the opinion that a wet ladle lip is responsible for the trouble. In rare instances these slushy compounds float into the riser where they do no harm. In the majority of instances, with the fiendish perversity of inanimate objects, they stick to the sides of molds or cores, or float into a place where the casting is to be machine finished.

A close check on every link in the chain of production from the cupola spout to the poured mold should disclose the specific cause of your present trouble.

Controlling Scrap and Waste

Q.—Will you please give us the dates of publication and titles of any articles appearing in THE FOUNDRY on the subjects of scrap control and material waste?

A.—If we understand your inquiry correctly, it is rather a large order since it would involve articles on melting, sand control, molding practice, etc. Along that line we have located a few articles as follow: "Conserving Raw Materials," by Hiram Brown, January, 1949; "Quality Control in the Foundry," by R. C. Byers and Joseph Dickman, May, 1949; "Determinable Variations in Close Tolerance Castings," by L. M. Neilsen, February, 1948; "Correction of Foundry Waste," by A. J. Edgar, October 1946; "Weighing Cupola Fuel and Metal Charges," by D. J. Reese, March, 1945; "Absorbed Gases in Cast Iron," by E. V. Sommers and D. W. Gunther, March, 1947; "Preventing Gray Iron Surface Roughness," by E. V. Sommers, March 1946; "Elimination of Castings Defects," by George Johnstone Jr., August and September, 1946; "Controlling Gray Iron Quality," by J. E. Linabury, February, 1946; "Salvaging Iron Casting with Machinable Arc Welds," by S. Epstein and D. W. DeArmand, May, 1947.

Procedures Cannot Be Compared

Q.—Is the cire perdu method described in "Casting Artistic Bronzes," which was published in the December, 1947 issue of THE FOUNDRY, considered superior to the piece mold method for producing statuary and other forms of ornamental castings? At present we use the piece mold method exclusively, and would like to try the other method. Could you give us information on the composition of the wax and the mold material?

A.—It is not possible to state dogmatically that one method of producing statuary and ornamental castings is better than the other since they are not comparable, and each is superior in its field. A wide variety of wax compositions are employed for making the patterns, and may be compounded from petroleum wax, beeswax, ceresin, etc. The particular article you mention states that the wax composition is composed of 30 per cent ceresin and 70 per cent beeswax. The molding composition or material is silica and plaster of paris or gypsum. Amount of plaster may vary from 30 to 50 per cent, and the silica from 50 to 70 per cent. First coat on the pattern usually employs a fine grade of silica, and the backing material is coarser to provide a more permeable mold.

Suppose your foundry employed less than 100 . . .

If your foundry employed less than 100 workers, would you load ferrous metal into charging buckets by hand—or with a magnet?

There is only one profitable answer to this question when you consider the high cost of today's labor. Yet, thousands of medium-size foundries continue to handle scrap, rails and pig *by hand* in the melt department. *The money they waste would pay for a lifting magnet in a few short months.*

An Ohio lifting magnet is the lowest cost—and fastest—way to make up the charge. Foundry cost records prove this statement. Flexibility? A capable crane operator drops the load piece by piece for "last pound" accuracy.

Save time . . . save money by turning costly man-hours into profitable magnet-minutes. Write to Ohio—*25 years a leader in magnetic materials handling.*

How would you load charging buckets?

SELECT YOUR MAGNET from two Ohio types. The PROTECTO-WELD magnet, shown above, is made in 39, 46, 55 and 65-inch diameters. Bolted construction types include these and other smaller sizes. Ohio also builds magnet control equipment.

5 TYPICAL JOBS WHERE OHIO MAGNETS CUT COSTS

- unloading scrap, rails and pig iron.
- loading charging cars, hoppers and buckets.
- loading and unloading annealing cars.
- moving bulky castings in cleaning dept.
- picking up sprues, gates, runners, overflow.

THE OHIO ELECTRIC MFG. CO. • 5900 MAURICE AVENUE • CLEVELAND 4, OHIO

Ohio MAGNETS

A-2016

OF INDUSTRY

C. G. EICKMEYER has been appointed manager, Foundry Division, Hansell-Elcock Co., Chicago. A native of St. Louis, Mr. Eickmeyer attended Hadley Trade School and Washington University in that city. He has been associated with the Duncan Foundry & Machine Works Inc., Alton, Ill., and for the past 13 years, with Sorbo-Mat Process Engineers, St. Louis.

♦ ♦ ♦

George W. Altman has been appointed foundry engineer, National Radiator Co., Johnstown, Pa. He will have headquarters there and will rotate among the company's other foundries in New Castle, Pa. and Trenton, N. J., on behalf of engineering and metallurgical phases of foundry operation. Mr. Altman attended Carnegie Institute of Technology and until recently was general manager of Bridgman Castings Inc., Bridgman, Mich., subsidiary of the Hannifin Corp., Chicago. Prior to that he was associated with the Lennox Furnace Co., Columbus, O., and Pittsburgh Coke & Iron Co., Pittsburgh. In the recent war, during service with Army Engineers, he operated a foundry in England and later in Aachen, Germany.

♦ ♦ ♦

Herman G. Hetzler, president and owner of Hetzler Foundries Inc., Rochester, N. Y., recently was elected president of the Rochester Chapter of the American Foundrymen's Society for the ensuing year. Long a resident of Rochester, Mr. Hetzler completed his education at the Mechanic's Institute, now Rochester Institute of Technology, where he majored in engineering and mechanical drawing. His foundry career began in the backyard of his home, making castings in a hen coop. He and his father organized a foundry in 1912 to produce aluminum, brass and bronze castings. Some of the first aluminum castings in the Rochester area were made in their shop and the now famous Wright brothers were among their early customers. The business grew steadily and in 1916 was transferred to Villa street where iron castings were added to its list of products. In addition to his foundry career, Mr. Hetzler is recognized as an authority on the history of that section of New York state. He has erected at his own expense numerous bronze markers identifying historical sites.

♦ ♦ ♦

H. Wilmoth, formerly plant superintendent, Pan American Alloys Inc., Scottdale, Pa., has organized and has been named president of Mt. Pleasant Pattern & Casting Co., Mt. Pleasant, Pa., producer of nonferrous castings, metal and wood patterns and cast matchplates. **I. C. Davis,** who has been associated with his father in the Davis Pattern Shop, Scottdale, Pa., is treasurer of the new company. **C. A. Bodle** has been named vice president and **C. E. Weinkauf** is in charge of sales. Mr. Wilmoth, following an apprenticeship in tool and die making, joined Ford Motor Co., Detroit, where he became foreman of the machine shop. About 12 years later he was appointed foreman, Ray-Day Foundry & Machine Co., Detroit, and specialized in production of aluminum pistons. In 1942, when Pan American Alloys Inc. was organized in New Orleans, Mr. Wilmoth supervised installation of equipment, and in 1946 when the plant was moved to Scottdale, Pa., he became plant superintendent.

♦ ♦ ♦

Donald C. Sheldon has been elected assistant treasurer and **Kenneth A. Anderson,** assistant secretary, the American Brake Shoe Co., New York. Mr. Sheldon, who attended Fordham University, joined the company in 1941, following a connection with the Continental Bank & Trust Co., New York. Mr. Anderson attended Rutgers University, and has been with the company since 1944. Prior to that he was associated with the Interchemical Corp.

♦ ♦ ♦

Ralph H. Heberling, since 1944 vice president in charge of manufacturing, Edward Valves Inc., subsidiary of Rockwell Mfg. Co., East Chicago, Ind., has retired. Mr. Heberling joined the organization in 1942 as assistant to the president. Prior to that he was a manufacturer in the Chicago area and a consulting industrial engineer with the Business Research Corp. He will make his home in Whittier, Calif.

♦ ♦ ♦

Jack M. Lutz has been appointed assistant to the president, Continental Foundry & Machine Co., with headquarters at its general offices in

(*Continued on page* 104)

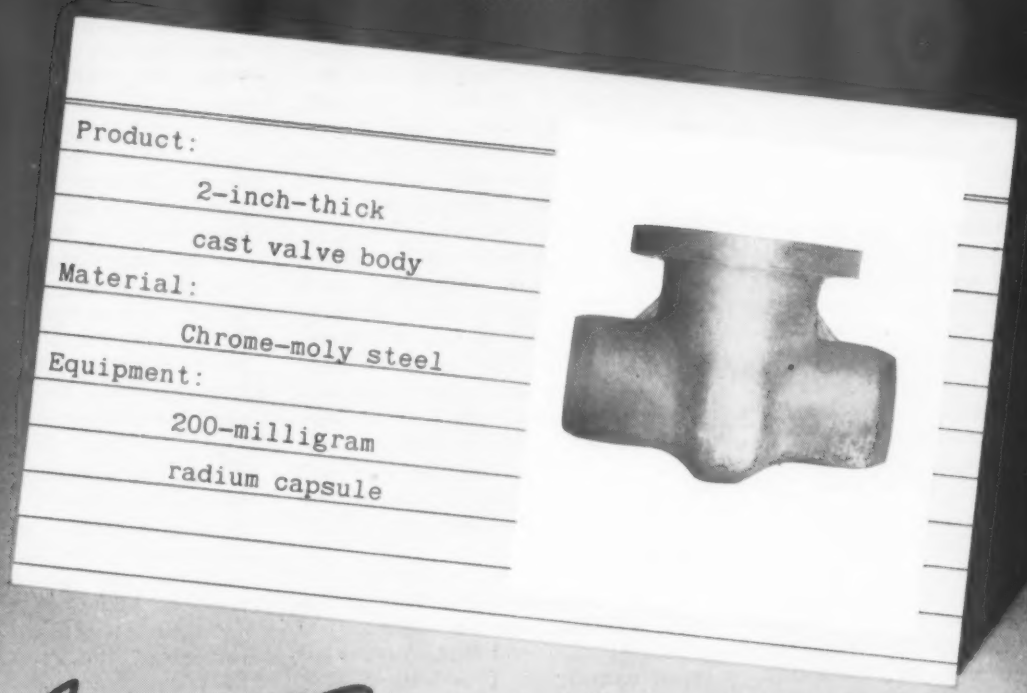
C. G. EICKMEYER

GEORGE W. ALTMAN

HERMAN G. HETZLER

H. WILMOTH

WHAT'S THE RIGHT X-RAY FILM?



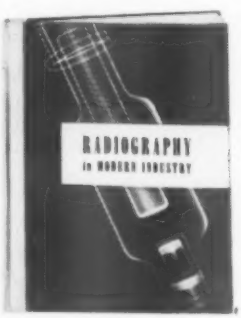
ANSWER:

KODAK INDUSTRIAL X-RAY FILM, TYPE K

This 20-inch valve body with its 2-inch-thick walls was radiographed with Kodak Industrial X-ray Film, Type K.

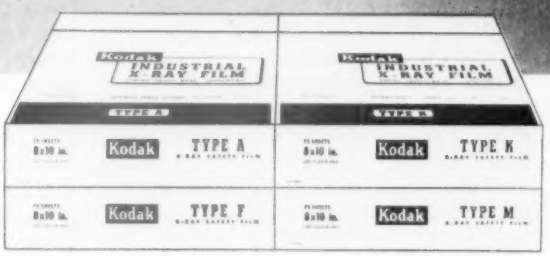
The radiographer chose this type because it has high speed to do heavy jobs like this with the shortest possible exposure time. In this case, exposure of only 30 minutes was sufficient.

With all its high speed, this film provides good radiographic quality to make sure that no significant imperfections in the casting will be missed.



RADIOGRAPHY IN MODERN INDUSTRY

A wealth of invaluable data on radiographic principles, practices, and technics. Profusely illustrated with photographs, colorful drawings, diagrams, and charts. Get your copy from your local x-ray dealer—price $3.



A TYPE OF FILM FOR EVERY PROBLEM

To provide the recording medium best suited to any combination of radiographic factors, Kodak produces four types of industrial x-ray film.

* * *

Type K has medium contrast with high speed. For gamma rays and for x-ray work where highest possible speed is needed at available kilovoltage without calcium tungstate screens.

Type F provides the highest available speed and contrast when exposed to x-rays with calcium tungstate intensifying screens. Has wide latitude with either x-rays or gamma rays, exposed directly or with lead foil screens.

Type M provides maximum radiographic sensitivity, high contrast, and exceptional detail under direct exposure or with lead foil screens. It has extra fine grain, and the speed is adequate for examination of light alloys at average kilovoltage and for much million-volt radiography.

Type A offers high contrast with about three times the speed of Type M but with slightly more graininess. Used direct or with lead foil screens for study of light alloys at low voltages, and of heavy steel parts with 1000-kv x-rays or gamma rays.

EASTMAN KODAK COMPANY
X-ray Division · Rochester 4, N. Y.
"Kodak" is a trade-mark.

Radiography

...another important function of photography

Kodak

Men OF INDUSTRY

(*Continued from page* 102)

East Chicago, Ind. Mr. Lutz has been engaged in steel industry sales for many years.

♦ ♦ ♦

David G. Anderson, whose association with the foundry industry extends over 40 years in engineering and operational supervisory positions, has established a consulting service to the industry with offices at 107 South Prospect Ave., Clarendon Hills, Ill. Mr. Anderson has been consulting foundry engineer on the staff of the National Foundry Association, Chicago, for the last two years, and previously he had been chief foundry engineer at the Chicago plant of the Western Electric Co., having joined that organization in 1926. Previous connections include Ohio Malleable Iron Co., Columbus, O., and Pittsburgh Engineering Co., Pittsburgh, where he was general superintendent.

♦ ♦ ♦

W. D. McMillan, elected president of the Chicago Chapter of the American Foundrymen's Society for the year 1949-50, is chief metallurgist, Farm Implement Division foundries, International Harvester Co., with headquarters at the company's McCormick Works, Chicago. Born in Aurora, Ill., Mr. McMillan was graduated from University of Chicago in 1920 with a degree in chemistry. He joined International Harvester Co. in 1923, as chemist at the Deering Works, Chicago, where he became chief chemist in 1927. He has been chief metallurgist at the McCormick Works since 1930. Mr. McMillan is a member of the executive committee and program and papers committee of the Malleable Division, American Foundrymen's Society, and vice chairman of its roundtable subcommittee and research committee. He is also a member of its recently established national publications committee. He served as vice president of the Chicago Chapter of the AFS, last year, chairman of the Chicago Chapter of the American Society for Metals in 1941-42, and is a member of the American Chemical Society.

♦ ♦ ♦

Gilfry Ward has been appointed vice president in charge of sales, American Manganese Steel Division, American Brake Shoe Co., New York, with headquarters in Chicago Heights, Ill. Mr. Ward joined American Brake Shoe Co. in 1928, following graduation from Yale University, and has spent many years on the East and West coasts with the sales organization of American Manganese Steel Division.

♦ ♦ ♦

D. W. Drummond has been named vice president, director of industrial chemical sales, and **S. L. Nevins** has been named vice president, director of agricultural chemical sales, Mathieson Chemical Corp., New York, as the result of retirement of **E. E. Routh,** vice president, director of sales. Mr. Drummond, a graduate of University of Pennsylvania, joined the company in 1938, as assistant sales manager of the carbon dioxide division, and became manager a year later. He has been vice president, general manager of sales since 1947. Other appointments include: **J. O. Logan,** sales manager, **R. J. Quinn,** assistant sales manager, and **L. P. Thomas,** southwestern sales manager, industrial chemical sales; and **J. S. Whittington,** sales manager, agricultural chemical sales. Mr. Thomas will be stationed in Houston, Tex., and Messrs. Quinn and Whittington in Baltimore. All others will be located in the executive offices, New York.

Dr. James R. Dudley has been appointed supervisor of new product development and **John D. McPherson,** supervisor of market research activities, American Cyanamid Co., New York. Dr. Dudley joined the company in 1940 as research chemist in its Stamford, Conn., research laboratories. Prior to his new assignment he was assistant in charge of research on polymers and resins. Mr. McPherson has been associated with the company since 1945, following his release from the Chemical Warfare Service of the Army. Until his recent assignment he was assigned to the Technical Division of American Cyanamid and worked on engineering development of new plants.

♦ ♦ ♦

J. D. Greensward has been appointed general manager of the Norwood, O., works, Allis-Chalmers Mfg. Co., Milwaukee, succeeding the late Frank H. Stohr. Mr. Greensward did shop work at Allis-Chalmers under a cooperative program at Marquette University, and received a degree in electrical engineering there in 1925. Following graduation he was assigned to the electrical engineering department of the company, later serving in the switchgear section. In 1942 he became assistant manager of the central station and marine department and has been assistant to the executive vice president for the past three years.

♦ ♦ ♦

Changes in personnel by Link-Belt Co., Chicago, have been announced:

John D. Riley has been appointed district manager of the Newark, N. J. office which has been moved to larger quarters at 31 Clinton St. Mr. Riley, who has been district sales engineer in the Boston office since 1939, succeeds the late George E. Ramsden in Newark. **Allan Craig,**

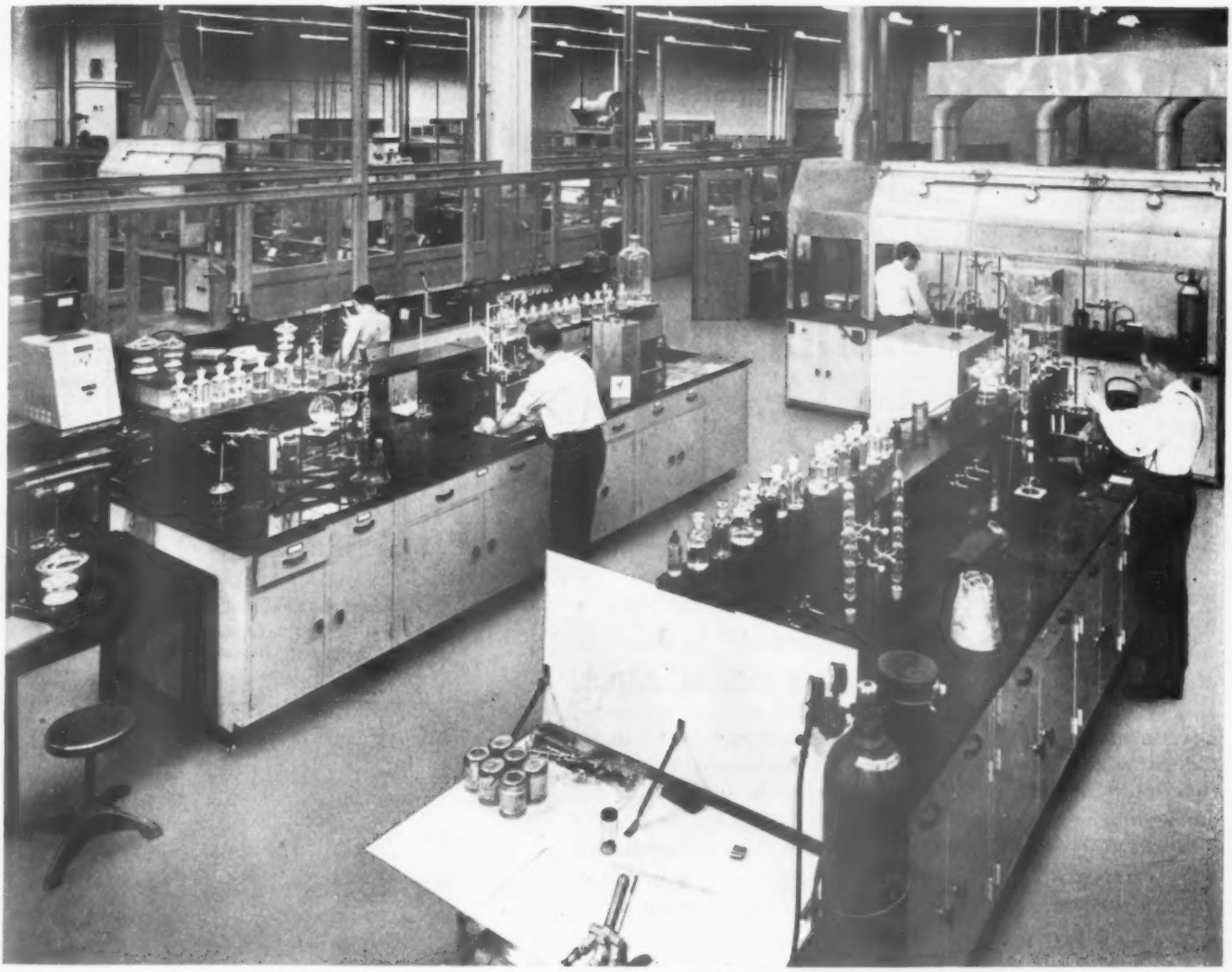
(*Continued on page* 107)

DAVID G. ANDERSON

W. D. McMILLAN

GILFRY WARD

D. W. DRUMMOND



Making laboratory analyses of grinding wheels and abrasive materials

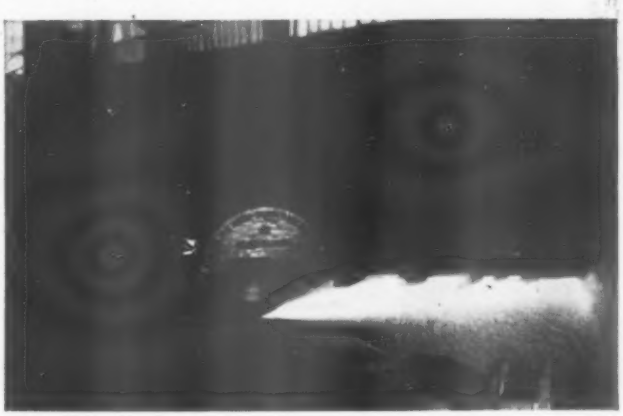
This is your grinding wheel laboratory

This is just one corner in the immense research and development laboratories of United States Rubber Company at Fort Wayne, Indiana.

Here "U. S." Abrasive Engineers work to lower your grinding wheel costs. They delve into every phase of bonds and abrasives, developing wheels that are more economical for snagging castings.

Their development work has revealed 5,000,000 possible combinations of size and construction. This means that they can produce the exact wheels you need for your conditions.

Take advantage of the "U. S." grinding wheel service. Write Grinding Wheel Dept., United States Rubber Company, Fort Wayne 4, Indiana.



MADE ONLY BY

U.S.RUBBER

SERVING THROUGH SCIENCE

UNITED STATES RUBBER COMPANY

KIRK AND BLUM

Plenum chamber hood "cleans up" mold conveyor operation

American Foundry Company Replaces old Dust and Fume Removal System with modern KIRK & BLUM INSTALLATION

As a major step in foundry modernization and clean-up, the American Foundry Company of Indianapolis replaced their old, inefficient mold conveyor hood with a modern, efficient hood, designed and installed by KIRK & BLUM. The old system, as shown in the "before and after" photos, was severely worn; the air withdrawal rate was low, permitting dust and smoke to escape into the foundry.

The new KIRK & BLUM hood is designed so that the top is a plenum chamber, distributing air along the entire length of the hood. Every other panel is removable for access. Four exhaust units connect to the hood; each has a capacity of 13,000 CFM. Total air removed, 52,000 CFM, assures this firm cleanliness never before possible.

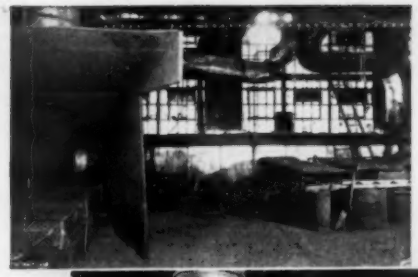
KIRK & BLUM systems, in many of the nation's leading foundries, practically eliminate dust and fumes from traditionally "dirty" jobs. Call the KIRK & BLUM Representative . . . more than 40 years of experience at your command, or ***write for your copy*** of "Dust Collecting Systems in Metal Industries," showing other typical installations. *The Kirk & Blum Mfg. Co., 2808 Spring Grove Ave., Cincinnati 25, O.*

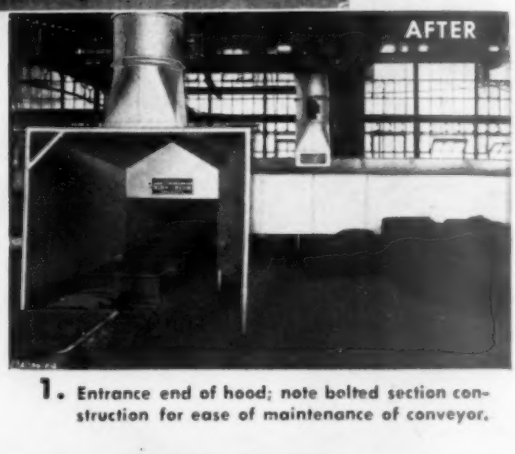
Designed, Fabricated and Installed by Liberty Engineering Div., KIRK & BLUM, Indianapolis, Ind.

FOR CLEAN AIR . . . THE INVISIBLE TOOL

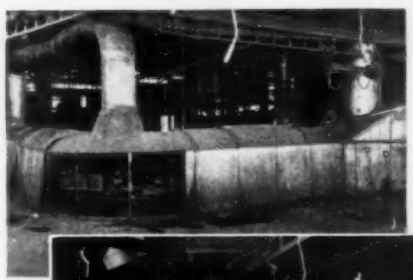
KIRK AND BLUM

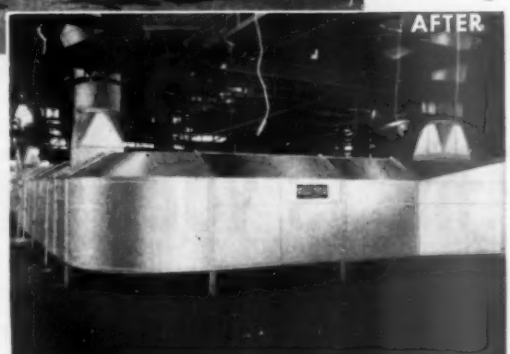
DUST AND FUME CONTROL SYSTEMS





1. Entrance end of hood; note bolted section construction for ease of maintenance of conveyor.





2. Corner of conveyor. Note that new hood is off floor for ease of cleaning.

3. Exit end of conveyor and hood, showing the four duct-mounted exhausters with total capacity of 52,000 CFM.

(*Continued from page* 104)

since 1945 sales manager of the southeastern division with headquarters in Atlanta, has been appointed general manager of the southwestern division, with headquarters in Houston, Tex., where a new plant has been opened. **Michael J. Perry,** who has been district manager in Moline, Ill., since 1946, succeeds Mr. Craig as sales manager of the southeastern division in Atlanta. **Andrew K. Kolar,** for the past 2 years district sales engineer in Moline, has been appointed district manager to succeed Mr. Perry.

♦ ♦ ♦

Frank A. Crossley will direct a program covering courses in basic foundry practice and foundry engineering to be part of the curriculum of a school of engineering which Tennessee Agricultural and Industrial State College, Nashville, Tenn. plans to establish. Mr. Crossley, who is completing requirements toward the degree of doctor of science in metallurgy at Illinois Institute of Technology, Chicago, is an instructor in the Department of Metallurgical Engineering at that institute. He received his degree of bachelor of science in chemical engineering there in 1945, while in the Navy V-12 program. Following release from Navy service in 1946 he returned to Illinois Institute of Technology and received a degree of master of science in metallurgical engineering the following year.

♦ ♦ ♦

James R. Shepard has been appointed western district works manager and **Thomas J. Wood,** eastern district works manager, Brake Shoe & Castings Division, American Brake Shoe Co., New York. Mr. Shepard, formerly eastern district works manager, attended Yale University and joined the company in 1937 as an apprentice. In his new position he will be located in Chicago. Mr. Wood, formerly superintendent of the division's Mahwah, N. J., plant, was graduated from Lehigh University and has been associated with the company since 1939. He will be located at the division's headquarters in New York.

♦ ♦ ♦

Eugene J. Ash, Buenos Aires, Argentina, is spending several weeks in this country on behalf of the Argentine army to observe the pro-

EUGENE J. ASH

cedures in dephosphorization of native Argentinian pig iron to make it suitable for steel production. Investigation was conducted at Timken Roller Bearing Co., Canton, O., using the electric furnace process, and two heats of steel were made successfully from all pig charges shipped from Argentina. While here, Mr. Ash also is studying new developments in foundry practices, materials and equipment.

♦ ♦ ♦

Nat Levin, John H. Garger and **James P. Moran,** formerly development engineer, assistant sales manager and research engineer, respectively, Induction Heating Corp., New York, have formed the High Frequency Foundry Sales Corp., with offices at 76 Beaver St., New York 5. The company will act as sales representatives for the Thermex Division of the Girdler Corp., Louisville, in connection with its high-frequency foundry core baking equipment, and will also handle other allied lines, offering a complete technical survey service to the foundry coreroom.

♦ ♦ ♦

Dr. Max Hansen has joined the staff of Armour Research Foundation of Illinois Institute of Technology as senior metallurgist in the nonferrous section of its metals department. Dr. Hansen, who has been an associate professor of metallurgical engineering at Illinois Institute of Technology since 1947, came to the United States from Germany in 1947 after completing a survey for the technical field information agency in the United States Military Government office. From 1937 through 1945 he was director of research for Durener Metellwerke, Duren, Germany.

♦ ♦ ♦

Charles E. Schley has been elected chairman of the board of directors, Philadelphia Bronze & Brass Corp., Philadelphia. **Donald Bryden,** associated with the corporation for 22 years, has been elected president and a director, and **Gordon E. Keim** has been named vice president and director. **Dr. F. R. Hensel** and **Ray F. Sparrow,** vice presidents of P. R. Mallory & Co. Inc., Indianapolis, which recently acquired a financial interest in Philadelphia Bronze & Brass Corp., have been elected to its board of directors. Other directors include **George Schmidt** and **Arthur Kitson.**

♦ ♦ ♦

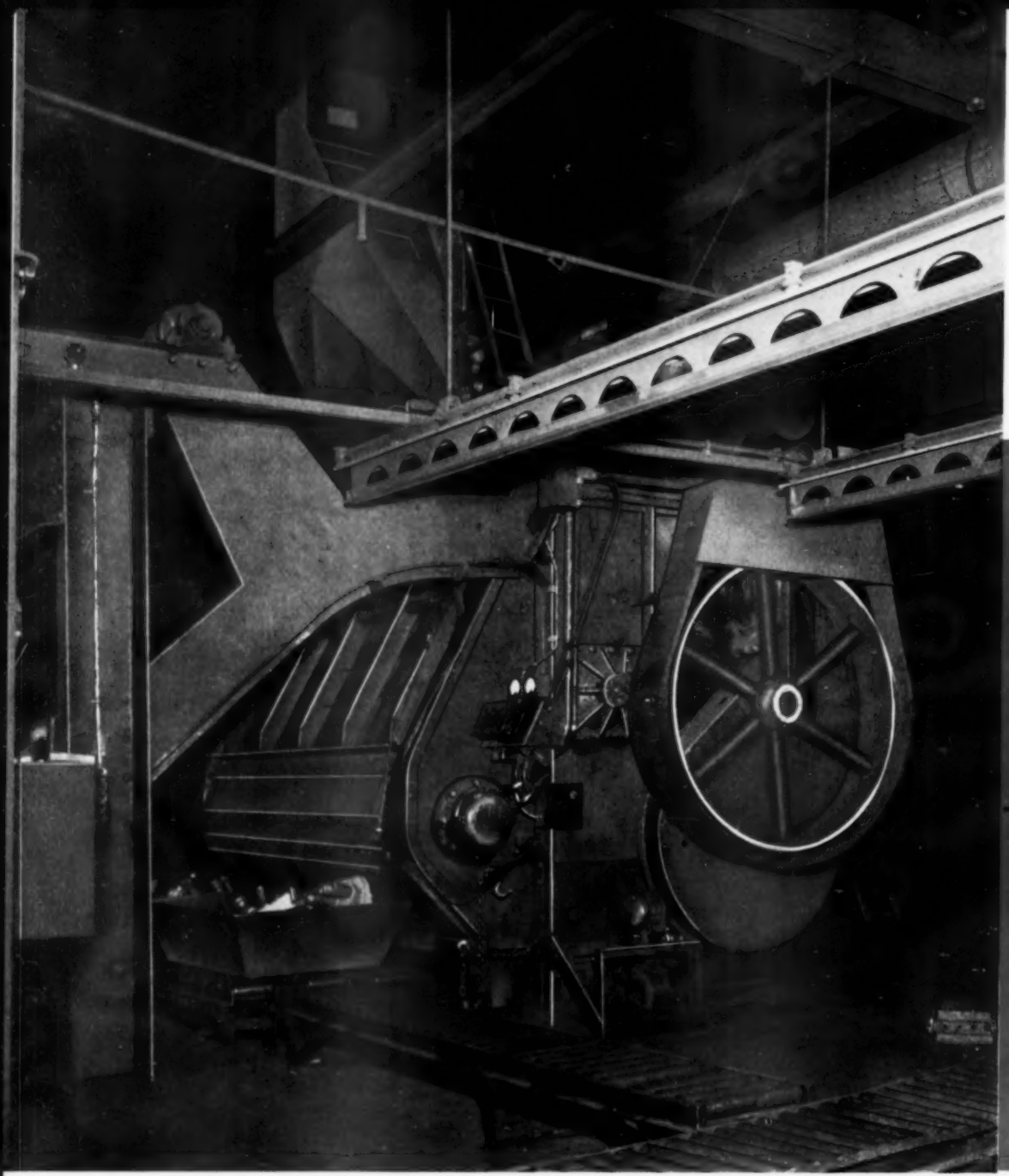
J. G. Schaefer has been named manager of the Youngstown, O., district office, Allis-Chalmers Mfg. Co., Milwaukee. Formerly a branch office, it has been moved to the Ohio Edison building, there. Mr. Schaefer joined Allis-Chalmers following grad-

(*Continued on page* 110)

FRANK A. CROSSLEY

JAMES R. SHEPARD

THOMAS J. WOOD



This machine is the largest batch-type blast mill made. It has a capacity of 63 cubic feet.

COMPARATIVE CLEANING COSTS

FORMER METHOD

WHEELABRATOR METHOD

WHEELABRATOR® SAVES $

FOR THE WEST MICHIGAN STEEL FOUNDRY CO.

The high speed cleaning and large capacity of the 60" x 96" Wheelabrator Tumblast are paying rich dividends for the West Michigan Steel Foundry. It has reduced manpower requirements 60% and has effected direct cash savings of $1491 each month. Indirect savings have been made which are hard to measure but are equally important. This giant Tumblast does a much better job of cleaning, with the result that less time is required for burning and grinding. It has reduced power consumption and has released valuable floor space for other important operations.

WORLD'S LARGEST BUILDERS OF AIRLESS BLAST EQUIPMENT

THE LARGEST BATCH-TYPE BLAST MILL MADE

The 60" x 96" Wheelabrator Tumblast has an operating load capacity of 63 cubic feet. This huge Tumblast is the largest batch-type blast mill being made today.

CLEANS UP TO 3½ TONS AT A TIME

The 60" x 96" Tumblast cleans more castings in ten minutes than the average machine cleans in an hour. It is being used effectively at the West Michigan Steel Foundry Company for cleaning loads weighing up to 7000 lbs.

CLEANS CASTINGS WEIGHING FROM ¼ LB TO 2800 POUNDS EACH

Castings being cleaned by West Michigan in their 60" x 96" Tumblast include the following:

Street car axle housings (green)—500 lbs. each—8 to a load.

Miscellaneous small annealed castings— approximately 7,000 lbs. in one load.

Fifth wheels— in the green—200 lbs. each—6 to a load. After annealing—150 lbs. each—12 to 14 to a load.

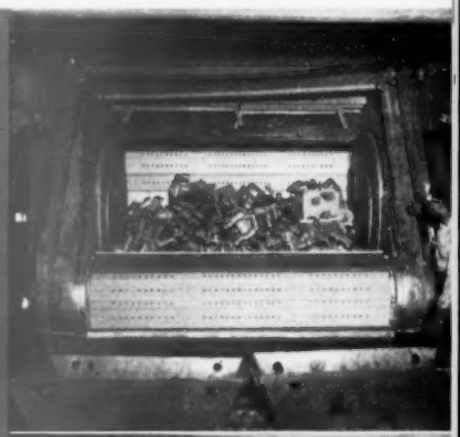
Four wheel drive transmission housings—(green) — 375 lbs. each—7 to a load. After annealing—240 lbs. each—9 to a load.

Squeezer work (castings up to 50 lbs. ea.)—5,000 lbs. per load.

Bath tub flasks weighing 2800 lbs. ea. cleaned one at a time.

at the **WEST MICHIGAN STEEL FOUNDRY CO.**

Castings are cleaned three times—in the green stage with gates and risers attached, after annealing and for finish after grinding and welding.



EQUIPMENT
Three Airblast Rooms

PRODUCTION
1297 tons per month

LABOR REQUIREMENTS
50 man hours daily

CLEANING COSTS
Per ton—$3.56

EQUIPMENT
60" x 96" Wheelabrator Tumblast
(63 cu. ft. capacity.)

PRODUCTION
1297 tons per month

LABOR REQUIREMENTS
19 man hours daily

CLEANING COSTS
(including maintenance)
Per ton—$2.41

WHEELABRATOR SAVINGS

Savings per ton—$1.15 Savings per month—$1,491.55
Savings per year—$17,898.60

$17,898 A YEAR

MUSKEGON, MICHIGAN

CLEANING TIME PER LOAD 6-10 MINUTES

Small castings "in the green"	10 minutes
Large castings "in the green"	6 minutes
After annealing	10 minutes
Reblast (after grinding and welding)	8 minutes

New informative book gives complete, concise information on all phases of airless blast cleaning. Write today for Catalog No. 74-A.

American

WHEELABRATOR & EQUIPMENT CORP.
505 S. Byrkit St., Mishawaka 2, Indiana

Men OF INDUSTRY

(*Continued from page* 107)

uation from Purdue University in 1935. He was associated with the company's Pittsburgh district office until 1945, when he became manager of the Youngstown branch office.

♦ ♦ ♦

C. R. McGrail, recently elected chairman of the Texas Chapter of the American Foundrymen's Society for 1949-50, is president, Texaloy Foundry Co., San Antonio, Tex. Mr. McGrail, a native of Worcester, Mass., received his metallurgical education at Carnegie Institute of Technology. He was first associated with the foundry department of the Fairbanks-Morse Co., Three Rivers, Mich., where he later became plant metallurgist. He then became foreman of the Chevrolet Gray Iron Foundry, Saginaw, Mich. Other connections include Struthers-Wells Titusville, Corp., Warren, Pa., and Steel Sales Corp., Chicago, where he was metallurgist and manager of the nickel and ferroalloys department. He has been president of the Texaloy Foundry Co., since 1944. Mr. McGrail is a former director of Gray Iron Founders' Society.

♦ ♦ ♦

Eads Johnson Jr., until recently sales representative of the Brake Shoe & Castings Division, American Brake Shoe Co., New York, has been appointed assistant vice president of its Southern Wheel Division. Mr. Johnson joined the company in 1934 following graduation from Yale University. In his new position he will continue to be located in New York.

♦ ♦ ♦

Paul Watts has been appointed general sales manager, Skilsaw Inc., Chicago, manufacturer of portable electric and pneumatic tools. Mr. Watts, who has been associated with the electric tool industry for 25 years, joined Skilsaw Inc. 9 years ago and has been its Pacific coast manager since 1947. He will be located in the company's recently enlarged plant and main offices in Chicago.

♦ ♦ ♦

R. O. Anderson has been put in charge of a new district recently established in the St. Louis area by Norton Co., Worcester, Mass. The district includes territories which previously composed the Rocky Mountain and South Central districts, now discontinued, and two areas formerly in the Chicago district. Mr. Anderson was formerly in Denver. **H. G. Brustlin** has been appointed abrasive engineer in charge of the Denver territory and will make his headquarters there, under supervision of Mr. Anderson.

♦ ♦ ♦

Louis T. Friedman has been named head of the metallurgical engineering department in the laboratories of Sam Tour & Co. Inc., New York. Mr. Friedman, a graduate of City College of New York, until recently was assistant professor of engineering at Champlain College. He was formerly plant metallurgist, Moldcast Products Co. and Eastern Metal Products Co., Tuckahoe, N. Y. He has supervised a development program on casting of ferrous and nonferrous metals by the precision investment method.

♦ ♦ ♦

G. A. Lorz has been appointed superintendent of operations at the Garrison plant, Mackintosh-Hemphill Co., Pittsburgh. Mr. Lorz, who joined the company in 1907, has been foundry superintendent in Pittsburgh since 1940. He is now in charge of all manufacturing operations in the foundry, roll, pattern and machine shops, and in the melting department. **O. B. Douthett,** who has been with the company for 26 years, succeeds Mr. Lorz as general foundry foreman at the Garrison plant. **Walter J. Johnson,** formerly production manager, has been named assistant plant manager there. **C. R. Hodgson** has been appointed superintendent of operations at the Midland, Pa., plant in charge of open hearth, foundry, pattern, roll and machine shops. **O. Feicht,** a patternmaker since 1923, succeeds Mr. Hodgson as general foundry foreman, Midland plant.

♦ ♦ ♦

James L. Crawford, formerly vice president-general manager, Walsh Refractories Corp., St. Louis, has been named president, succeeding **N. S. C. Walsh,** who has been made chairman of the board of directors. Following graduation from University of Illinois, in 1917, with a degree in ceramic engineering, Mr. Crawford was associated with Westinghouse Lamp Co., Bloomfield, N. J. From 1923 to 1932 he was engaged in managerial and research activities with Laclede-Christy Co., St. Louis. He joined Walsh Refractories in 1932 as general manager, later becoming vice president-general manager and a member of the board of directors.

♦ ♦ ♦

James W. Lintern has been elected executive vice president, the Lintern Corp., Berea, O. Other new officers elected include: **J. N. H. Christman Jr.,** vice president in charge of engineering; **Ted Ley,** vice president in charge of production; **F. T. Siersma,** vice president; **Edward Warnoski,** assistant treasurer and auditor; and **John C. Lintern,** secretary. **William A. Lintern** continues as president and treasurer.

♦ ♦ ♦

V. A. Crosby, metallurgical engineer in charge of sales, service and development for Climax Molybdenum Co. at Detroit, flew to Europe on

(*Concluded on page* 112)

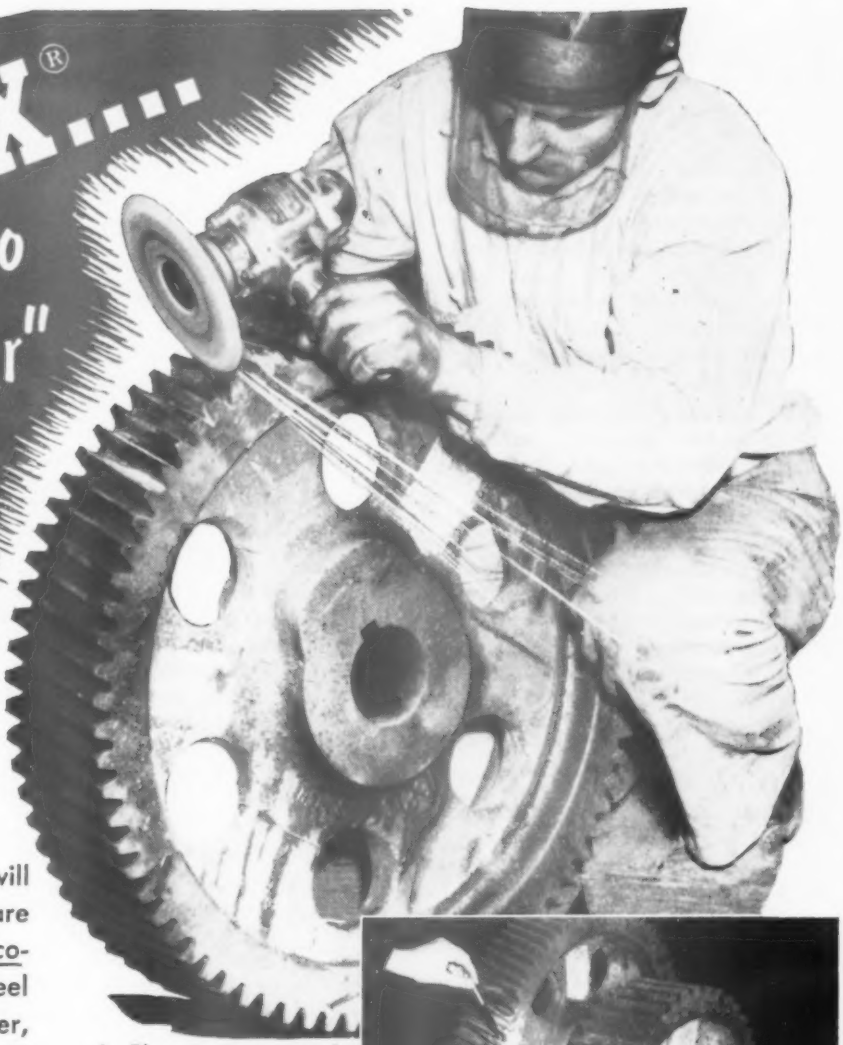
C. R. McGRAIL

EADS JOHNSON JR.

PAUL WATTS

BAYFLEX®....

..the Answer to some "64 dollar" WELDING QUESTIONS

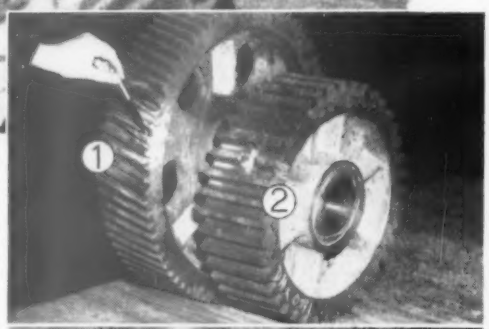


Thousands of satisfied users will support our claim that Bayflex discs are unequaled for *fast*, *safe*, *clean* and *economical* grinding and finishing of steel welds, stainless welds, bronze, copper, aluminum or iron alloy surfaces. It will pay *you* to investigate this new labor-saving, money-making abrasive product.

Write us today for a demonstration — no obligation on your part.

BAY STATE ABRASIVE PRODUCTS CO.
Westboro Massachusetts, U. S. A.

Branch Offices and Warehouses
Chicago — Cleveland — Detroit — Pittsburgh
Distributors — Principal Cities



1. The excess metal-deposit on this job was removed by a 7"x 3/16"–24 grit disc.
2. A broken tooth prior to welding and smoothing.

Bayflex discs are unexcelled for smoothing welds . . . they outperform the ordinary coated abrasive disc 40 to 1 or better.

Preparation of cracks before welding . . . a typical application. Discs will fit all standard right angle head grinders and sanders, air or electric.

BAY STATE®

MEMBER OF THE GRINDING WHEEL INSTITUTE

Top Performance Consistently Duplicated

Men OF INDUSTRY

(*Concluded from page* 110)

June 11 to spend several weeks in France and England. He attended the annual meeting of the Institute of British Foundrymen on June 15 and 16, and is visiting with many outstanding foundrymen in both France and Great Britain.

♦ ♦ ♦

John E. Carroll has been appointed general sales manager, American Hoist & Derrick Co., St. Paul. Mr. Carroll was graduated from University of Minnesota and joined American Hoist & Derrick Co. in 1937, serving as district sales representative in the Texas, Chicago and West Coast territories. He resigned his sales position to become a partner in the firm of Harron, Rickard & McCone Co., of southern California where he headed the Construction Equipment Division.

♦ ♦ ♦

Donald L. Price has been named sales manager of the new central region recently established by Norton Co., Worcester, Mass., which includes territories around Cleveland and Detroit. **William A. Russell,** formerly abrasive engineer for the company in Toledo, O., succeeds Mr. Price as Detroit district manager for the company's Abrasive Division. Mr. Price joined the company in 1922 and has served in the Detroit office since 1926 as engineer and as district manager since 1944. Mr. Russell, associated with the company since 1939, served in the Pittsburgh district prior to assignment to the Toledo territory in 1946.

♦ ♦ ♦

John Mulholland has been appointed metallurgist, Central Foundry Division, General Motors Corp., Danville, Ill., succeeding **Fred Carl,** who has joined the metallurgical department of Allison-Bedford Foundry, Bedford, Ind., Allison Division of General Motors Corp., Detroit.

♦ ♦ ♦

Donald Williams, formerly general sales manager, the Dow Chemical Co., Midland, Mich., has been named director of sales, succeeding **Leland I. Doan,** who recently was elected president. **Donald K. Ballman,** formerly assistant general sales manager, has been named general sales manager, and **Dr. L. S. Roehm,** who is in charge of the Technical Service and Development Division, will also act as assistant general sales manager.

♦ ♦ ♦

Arthur J. Fausek, president, Modern Engineering Co., St. Louis, has been elected president of the International Acetylene Association, New York. **C. E. Monlux,** vice president, Linde Air Products Co., New York, has been named vice president. **E. V. David,** Air Reduction Sales Co., New York, was re-elected treasurer and **H. F. Reinhard** was re-elected secretary.

♦ ♦ ♦

Karl S. Howard of Philadelphia, vice president, General Steel Castings Corp., Eddystone, Pa., received the advanced degree of professional engineer at the 88th annual commencement at Washington University, St. Louis, June 7. Mr. Howard, who was graduated from the university in 1909, received the degree for his special thesis, "Sand Reclamation in the Steel Foundry."

♦ ♦ ♦

L. K. Harkrider, president, General Malleable Corp., Waukesha, Wis., has been reelected president of the Wisconsin Manufacturers' Association. **R. K. Schreiber Jr.,** president, the United States Motors Corp., Oshkosh, Wis., and **Fred C. Doepke,** president, Wrought Washer Co., Milwaukee, were elected directors of the association.

♦ ♦ ♦

G. R. Ritter has been named superintendent of the new aluminum foundry recently opened in Mishawaka, Ind., by United States Rubber Co., New York, for production of aluminum molds for auto floor mats, and foam rubber. Process used was developed by Mr. Ritter and **Max Austin,** also associated with the company.

♦ ♦ ♦

Peter P. Ruppe, formerly chief engineer, has been appointed general manager, Hapman Conveyors Inc., Detroit. Mr. Ruppe, a graduate of Michigan State College, was formerly associated with United States Rubber Co., New York, and Briggs Mfg. Co., Detroit.

♦ ♦ ♦

William L. Garner, formerly general night superintendent, Pratt & Letchworth Co. Inc., Buffalo, is now service engineer, Pittsburgh Metals Purifying Co., Pittsburgh. Prior to 1945, he had been associated with Calumet Steel Castings Corp., Hammond, Ind.

♦ ♦ ♦

D. L. Coleman, since 1943 field engineer in the Detroit district, Ampco Metal Inc., Milwaukee, has been named district manager of the recently established eastern Texas division, with headquarters in Houston, Tex.

♦ ♦ ♦

A. W. Anderson, vice president, the Claud S. Gordon Co., Chicago, has resigned because of ill health, following 31 years of service with the company.

♦ ♦ ♦

Guy Jones has been appointed director of purchases, Swayne, Robinson & Co., Richmond, Ind., succeeding **J. W. Corcoran,** who has resigned.

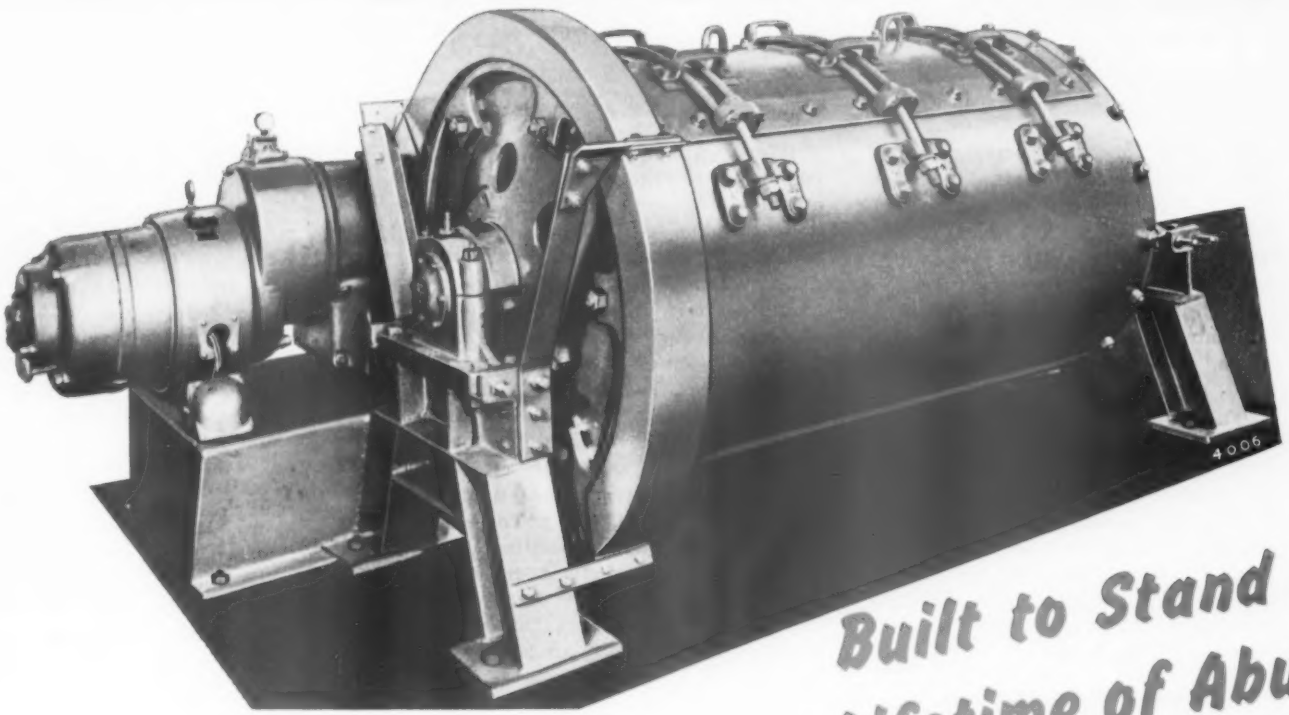
JOHN E. CARROLL

WILLIAM A. RUSSELL

DONALD L. PRICE

SLY TUMBLING MILLS

THE STANDARD OF STURDINESS



Built to Stand a Lifetime of Abuse!

In 1915 we built Sly Tumbling Mills and have been building them ever since. Many of the earliest ones are still in use.

Today we are building Sly Tumbling Mills immeasurably more sturdy—for even longer life. They have won widespread recognition as the Standard of Sturdiness.

Modern throughout:

- Roller bearings, extra large
- Individual motor drive for operating flexibility
- Positive brake for stopping and holding the mill securely for loading and unloading
- Push button control

All add up to . . .
safe and economical operation.

Use modern equipment to combat high costs.
Sly engineers will help you solve your tumbling problems. Write us.

THE W. W. SLY MANUFACTURING CO.

4753 TRAIN AVENUE • CLEVELAND 2, OHIO

Representatives in New York • Chicago • Philadelphia • Detroit • St. Louis
Toronto • Minneapolis • Cincinnati • Rochester • Los Angeles • Birmingham

Man-to-Man

ON THE MOLDER'S BENCH

"Advertising Knick-Knacks for the Foundry"

By RALPH L. LEE

EVERY once in a while one of my foundry friends either hands me or sends me some little cast advertising knick-knacks that they have made themselves. I don't know how many ash trays, paper weights, book ends, paper knives, and things like that I have collected. Some of these articles are pretty good; what I mean is, if it's an ash tray, it will hold an ash or two, and they are all right from an appearance standpoint. But in looking over the whole batch, I must confess that most of them are somewhat on the "rough and rugged" side. At least, from my way of thinking, they don't, as ornaments, measure up to the quality of the work done by the folks who gave them to me.

Gadgets Should Be Good

I think I can understand this too; these foundry folks don't pretend to be designers of knick-knacks or sculptors. Some of them have darn good pattern shops, but after all, a person can be one of the best patternmakers in the country and yet have one heck of a time trying to design or model an ornamental ash tray that would stand up alongside one a person could buy in almost any store.

I was talking about this subject to a foundry friend of mine down South who had done considerable modeling and ornamental bronze work himself. He said he had never given the matter much thought, but now that I had reminded him of it, he had to agree that some awfully corny stuff had been cast by foundrymen and given away to their friends and customers. In fact, he suggested that I write this article on advertising novelties for the foundry.

Shortly after I got back home, a good-size box came. When I opened it I found a lovely brass door knocker, an ornate cast picture frame with bunches of grapes and stuff all over it, and a small cast aluminum double boiler. There was also a little toy skillet which, by the way, he had cast from a pattern I had sent him.

Mother (my better half) almost had conniption fits. She said that the door knocker was exactly what she had been wanting for a long time and insisted that I go right out to the front door, take the old door knocker off, and put up the new one —which, of course, I did. The brass picture frame was just like those she had seen advertised in *House Beautiful,* and since she had several double boilers, she gave this one to my son, who is going to be married this fall.

Like most everyone, I suspect, I've got several boxes of advertising novelties cached away in my dresser drawers and the cupboards in my study. There must be at least a dozen cigarette lighters of various vintages and lightabilities. I don't know how many trick pencils, trick pocket knives, and pens I've got. Notebooks, pocketbooks, and letter-folds galore.

I believe it would take a good-size basket to hold the ash trays, paper weights, and calendar stands I have collected over the years. All these things have the names of the companies who gave them away on them in different degrees of prominence.

Out of this whole collection are some I find myself using all the time. They keep whispering in my ear, or flashing in my eye, the names of the folks who gave them to me.

Knowing that these folks couldn't afford to hand out presents to everyone who comes along, I naturally feel that since I was one of the few who did get a present, that I was sort o' special, and maybe on a preferred list. Being on this list, I would probably get special service if I did business with these folks. In checking back, I found I was right, for I, without hardly knowing it, unconsciously favored those who kept their names before me with some little inexpensive billboard on my desk, in my pocket, or somewhere in my house pleasantly reminding me of the nice folks who gave them to me.

Advertise Foundry Work

I, of course, appreciate that we in the foundry business could go haywire giving things away, and expect too much as a result of it. But on the other hand, if we decide on doing something like this, it seems to me that we've got to be sure that whatever we hand out advertises the kind of folks we really are and the high quality of work we do. These articles certainly won't do this if they go into the ash can, but even if they don't but are considerably on the amateurish side, they won't help us much.

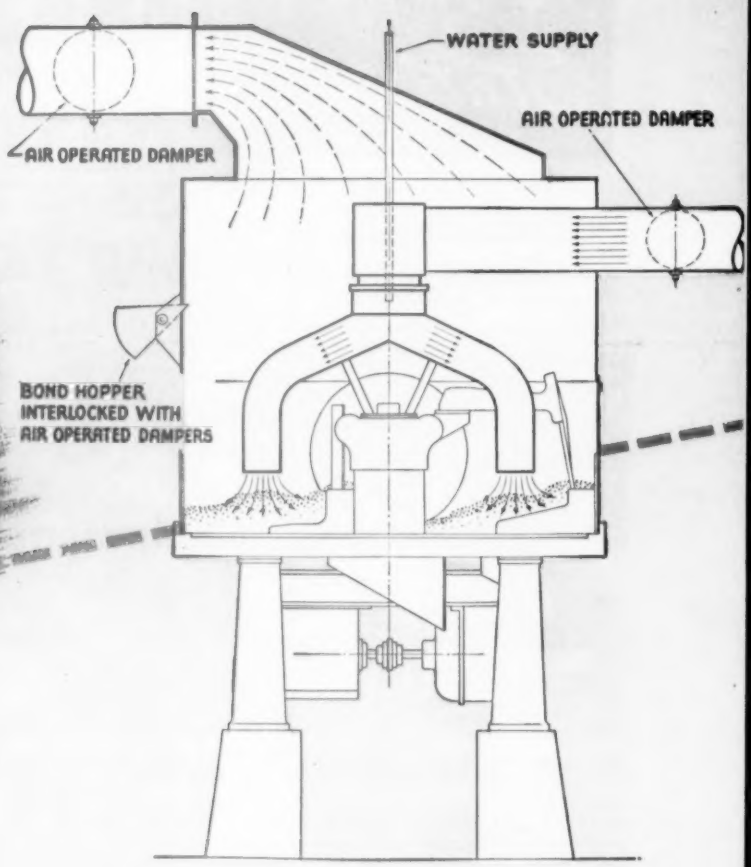
SO - - - it seemed to me that we ought to pick out something that we know people can and will use, whether it be ash tray, paper weight, calendar holder, letter opener, book ends, picture frames, door knockers, foot scrapers, toys for the kids, or what have you.

Then after settling this question, get hold of someone who is a master of design; we certainly would get help on any other advertising we were going to do. If the thing we decide upon is to be decorated, we could get hold of a real sculptor to make the original for the pattern and then we'd do the bang-upenist job of molding, finishing, or plating we possibly could.

Anyway, it's a thought.

Here's the solution to your HOT SAND problem...

Install the new NATIONAL *Rotary Cooling Hood* on your SIMPSON MIXER



—IMPROVES MOLDABILITY
—REDUCES SCRAP
—CUTS OPERATING COSTS

THE new National Rotary Cooling Hood now offers a tested and proved solution to the problem of rapidly and efficiently cooling hot foundry sands. Reports from users in many sections of the country offer positive proof that this new high-capacity Cooling Hood provides *complete control* of sand temperatures throughout a wide range of mixing cycles, even under the most extreme sand temperature conditions.

National Rotary Cooling Hoods are now available for installation on standard Simpson Intensive Mixer models. Plan now to install these Cooling Hoods on new or existing Simpson Mixers. Descriptive literature will be sent on request.

Here's how it works...

The basic principle employed in the new Rotary Cooler is the proved mechanical principle of cooling through evaporation. Excess moisture is added to the sand, and air at high velocity is forced through the sand as it passes over the plows. As the moisture is evaporated, the heat in the sand is transferred to the vapor generated, and carried out of the mixer. A slight vacuum is maintained in the mixer to prevent dust laden air from escaping into the work area.

LET A NATIONAL ENGINEER SHOW YOU HOW THE NEW ROTARY COOLING HOOD WILL HELP SOLVE YOUR HOT SAND PROBLEMS...

Call or write for details!

NATIONAL ENGINEERING COMPANY

608 MACHINERY HALL BUILDING • CHICAGO 6, ILLINOIS

Manufacturers and Selling Agents for Continental European Countries—The George Fischer Steel & Iron Works, Schaffhausen, Switzerland.
For the British Possessions, Excluding Canada and Australia—August's Limited, Halifax, England. For Canada—Dominion Engineering

FOUNDRY Statistics

Castings Production

In Philadelphia Federal Reserve District
(April, 1949)

Type	Percentage Change From Mar., 1949	Apr., 1948
Gray Iron	—24.1	—40.0
Malleable Iron	—47.2	—70.6
Steel	—15.5	—24.1
Nonferrous	—64.8	—77.6

Source: University of Pennsylvania.

Foundry Production Workers

ESTIMATED NUMBER:

Type Foundry	Feb. 1949	Jan. 1949	Dec. 1948
Gray Iron	105,800	109,000	113,100
Malleable Iron	34,800	36,600	39,000
Steel	72,300	73,800	74,900
AVERAGE WEEKLY EARNINGS:			
Gray Iron	$56.06	$57.14	$58.88
Malleable Iron	56.49	59.08	61.49
Steel	62.57	62.21	63.79
AVERAGE WEEKLY HOURS:			
Gray Iron	38.1	39.0	40.0
Malleable Iron	37.6	39.0	40.1
Steel	40.5	40.3	41.2

Source: Bureau of Labor Statistics. Estimates of number of foundry production workers adjusted to Federal Security Agency data through 1945.

Index of Foundry Equipment Orders

Foundry Trades Only
(Net Orders Closed, New Equipment)

	1948	1949
Jan.	380.9	149.9
Feb.	367.3	144.4
Mar.	326.2	190.8
Apr.	412.0	172.0
May	388.5	....
June	376.8	....
July	456.3	....
Aug.	324.7	....
Sept.	273.5	....
Oct.	296.0	....
Nov.	284.4	....
Dec.	243.7	....

Note: Figures are percentages of the base period 1937-1939 taken as 100 per cent (monthly average). Source: Foundry Equipment Manufacturers Association.

Shipments of Castings

(Reported by Bureau of the Census)

Gray Iron Castings

(Net tons)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1947			
Dec.	1,066,211	587,933	2,782,236
Total	12,540,960	7,181,299	.....
1948			
Jan.	1,064,335	584,238	2,802,685
Feb.	1,024,450	571,406	2,769,408
Mar.	1,169,085	659,821	2,726,415
Apr.	1,051,083	584,969	2,690,893
May	992,692	555,728	2,601,626
June	1,072,040	597,624	2,587,081
July	914,464	490,359	2,601,084
Aug.	1,050,948	597,678	2,598,789
Sept.	1,088,051	615,978	2,587,385
Oct.	1,148,422	642,485	2,522,831
Nov.	1,099,827	606,380	2,406,737
Dec.	1,110,512	624,739	2,284,348
Total	12,785,909	7,131,405	.....
1949			
Jan.	1,040,343	573,164	2,064,861
Feb.	986,591	535,163	1,857,403
Mar.	1,074,704	567,041	1,639,465

Steel Castings

(Net tons)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1947			
Dec.	148,124	110,970	489,364
Total	1,625,055	1,203,504	.....
1948			
Jan.	141,068	108,282	491,745
Feb.	142,434	107,762	497,097
Mar.	162,891	125,550	508,822
Apr.	150,305	114,896	472,370
May	143,337	111,616	482,531
June	152,894	117,794	469,973
July	120,445	87,927	497,410
Aug.	140,223	107,538	472,481
Sept.	149,222	112,551	447,972
Oct.	152,983	114,819	424,460
Nov.	146,835	110,275	395,013
Dec.	157,395	116,285	354,458
Total	1,760,032	1,335,295	.....
1949			
Jan.	140,577	103,503	338,889
Feb.	135,042	99,425	320,202
Mar.	138,889	102,027	284,754

Malleable Iron Castings

(Net tons)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1947			
Dec.	77,757	44,042	202,408
Total	895,054	513,228	.....
1948			
Jan.	77,927	45,788	205,859
Feb.	75,225	42,670	209,447
Mar.	86,767	50,065	203,351
Apr.	80,602	46,034	199,578
May	76,078	42,338	191,553
June	81,747	48,170	178,760
July	64,995	35,018	180,421
Aug.	73,272	41,201	176,824
Sept.	77,815	43,985	164,002
Oct.	81,761	44,305	158,351
Nov.	77,194	42,241	146,422
Dec.	79,882	43,397	137,385
Total	933,265	525,212	.....
1949			
Jan.	71,876	38,040	126,393
Feb.	66,744	35,074	118,318
Mar	72,052	38,143	102,379

Aluminum Castings

(Thousands of pounds)

	Shipments Total	Shipments Sand	Shipments Perm. Mold	Unfilled *Orders
1947				
Dec.	37,489	12,552	13,784	81,784
Total	441,996	155,112	174,515	.....
1948				
Jan.	37,889	12,670	15,020	86,176
Feb.	37,963	12,177	15,055	88,032
Mar.	41,794	13,343	16,258	78,344
Apr.	38,269	12,407	14,563	78,499
May	33,868	11,854	12,351	75,219
June	35,822	12,296	13,239	72,930
July	28,944	9,851	10,504	70,321
Aug.	32,136	9,883	13,174	68,334
Sept.	35,877	11,822	13,353	66,773
Oct.	35,542	11,733	13,216	65,538
Nov.	34,550	11,410	13,012	63,767
Dec.	31,836	10,335	11,589	59,154
Total	424,490	139,781	161,334	.....
1949				
Jan.	29,142	9,702	10,386	55,580
Feb.	27,228	9,286	9,339	52,916
Mar.	27,478	9,348	9,386	50,508

Copper-base Alloy Castings

(Thousands of pounds)

	Shipments Total	Shipments Sand	Shipments Perm. Mold	Unfilled *Orders
1947				
Dec.	87,215	79,495	4,393	74,814
Total	1,051,742	960,732	51,139	.....
1948				
Jan.	85,432	77,433	4,593	74,579
Feb.	87,169	79,329	4,509	71,143
Mar.	96,344	87,249	5,261	70,544
Apr.	89,035	80,426	4,705	70,726
May	81,286	72,982	4,910	65,818
June	84,817	76,241	5,148	64,149
July	71,803	64,389	4,670	66,014
Aug.	81,976	73,947	5,018	69,126
Sept.	86,973	78,830	4,999	66,574
Oct.	91,311	82,463	5,293	62,571
Nov.	86,497	77,751	5,107	60,892
Dec.	88,182	79,750	4,796	53,671
Total	1,030,825	930,790	59,009	.....
1949				
Jan.	76,348	68,379	4,593	48,124
Feb.	68,776	61,278	3,951	40,517
Mar.	70,173	62,557	3,927	37,646

Magnesium Castings

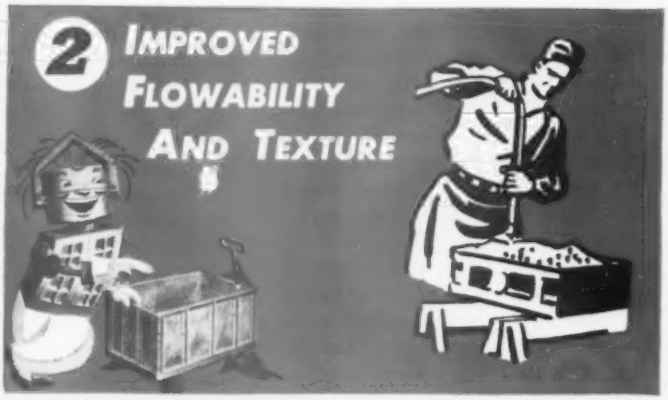
(Thousands of pounds)

	Shipments Total	Shipments For Sale	Unfilled *Orders
1947			
Dec.	669	587	2,730
Total	7,693	7,050	....
1948			
Jan.	659	597	2,701
Feb.	655	591	2,866
Mar.	704	625	2,741
Apr.	673	605	2,640
May	622	542	2,673
June	709	624	2,712
July	554	521	2,684
Aug.	703	655	2,834
Sept.	745	700	3,206
Oct.	708	650	3,070
Nov.	728	683	3,416
Dec.	754	695	3,455
Total	8,214	7,488	....
1949			
Jan.	822	761	3,821
Feb.	813	756	3,586
Mar.	879	800	3,227

* For sale only.

CORE TROUBLES?

4 WAYS TO GET BETTER RESULTS — USE KRAUSE CEREAL BINDERS



Yes — the qualities you need and want are yours in Krause's Cereal Binders—TRUSCOR (light weight) and AMERIKOR (heavy weight).

So why not take advantage of all these benefits by placing your next order with any of the distributors listed below or with us direct.

CHAS. A. KRAUSE MILLING CO., Milwaukee 1, Wisconsin

World's largest dry corn millers.

CEREAL BINDERS

DISTRIBUTORS

M. A. Bell Co.
Denver, Colo.
M. A. Bell Co.
Houston 2, Texas
M. A. Bell Co.
St. Louis 2, Mo.
A. L. Cavedo & Son, Inc.
Richmond 21, Va.
Foundry Supplies Co.,
Chicago 16, Ill.
J. H. Hatten & Son, Aldan,
Delaware Co., Pa.
J. B. Hayes Co.
Birmingham, Ala.
Independent Foundry Supply
Co., Los Angeles 11, Calif.
Marthens & Co., Moline, Ill.
Carl F. Miller & Co.
Seattle 4, Wash.
Milwaukee Chaplet & Mfg.
Co., Milwaukee 4, Wis.
Pacific Graphite Works
Oakland 8, Calif.
Porter-Warner
Chattanooga 2, Tenn.
Smith-Sharpe Co.
Minneapolis 14, Minn.
Frederic B. Stevens, Inc.
Buffalo 12, N. Y.
Frederic B. Stevens, Inc.
Cleveland 14, Ohio
Frederic B. Stevens, Inc.
Detroit 26, Mich.
Frederic B. Stevens, Inc.
New Haven 11, Conn.
Western Industrial Supply Co.
Portland 14, Ore.

By EDWIN BREMER

FOUNDRY Developments

SPECIALLY developed microscope is equipped with quick change revolving turrets, each containing 16 standard specimens. Device may be placed directly on the surface, or the piece to be examined may be placed on the stage of the instrument. Any one standard in the turret and the surface being inspected, are simultaneously visible in a split field with the same illumination, and may be compared. By revolving the turret the different standards are brought into juxtaposition with the surface being inspected, and it can be evaluated by optical comparison. The device, which is most useful in directly evaluating polished and ground finishes, is being adapted to evaluate mold surfaces, as-cast surfaces, and grain size from fractures of alloy castings.

* * *

MINERAL wool blankets, felts and industrial batts are classified by three temperature limit ranges—up to 500° F, up to 1000° F and up 1200° F according to Federal Specification HH-I-563. General requirement limitations include non-fibrous content, corrosiveness, moisture adsorption, temperature resistance, fire resistance and thermal conductivity. Detail requirements include construction of the three product forms and specification of their respective densities. Copies of the specification may be obtained gratis from Industrial Mineral Wool Institute, 441 Lexington Ave., New York 17.

* * *

PLASTIC-REPLICA technique by which texture of porcelain enamel may be studied conveniently and objectively evaluated, has been developed at the National Bureau of Standards by J. C. Richmond, Enameled Metals Laboratory, and A. C. Francisco, Porcelain Enamel Institute. Adapted from the replica procedure developed for use on machined metal, the method of evaluation is based on the haze of an ethyl cellulose replica of the enamel surface. Such replicas may be examined readily by either transmitted or reflected light, or projected for examination of the enlarged image. Details seen only with difficulty in the original surface are readily visible in the replica which is a faithful reproduction of the surface texture.

* * *

IN A PAPER presented by Gosta Vennerholm and H. N. Bogart, Ford Motor Co., Dearborn, Mich., at the recent AFS convention attention was directed to the importance of slag control in the production of malleable iron by the electric furnace process. With slags black in color and containing 25 to 35 per cent FeO, 100 per cent of the castings required recycling in heat treatment to obtain the desired structure. When the slags were dark green to black in color, containing 23 to 25 per cent FeO, 50 per cent of the castings required recycling and the remainder were only fair in appearance. With dark green slags containing 18 to 23 per cent FeO, 75 per cent of the heats were only acceptable malleable iron while 25 per cent were good. However, when the slags were light green in color containing up to 18 per cent FeO, 100 per cent of the castings were good.

* * *

RECENT work at the National Bureau of Standards by W. N. Harrison, J. C. Richmond and J. R. Crandall of the Enameled Metals Laboratory has revealed interesting effects of acid pretreatment of porcelain enamels on acid resistance and abrasion resistance. Acetic acid, which produced only minor visible attack, strongly inhibited further attack when subsequently treated with citric acid, although the citric acid severely attacked the untreated specimens. Surfaces treated with citric acid are found less resistant to abrasion.

* * *

FOR NONFERROUS work where it is desired to obtain a faster rate of cooling than can be accomplished with sand, and iron chills of the desired shape are not available, it is suggested that silicon carbide grit be tried. The grit, mixed with 2 per cent bentonite, 1 per cent molasses, and 2 per cent water, will give a cooling rate approximately that of iron or steel chills. Grit size of silicon carbide should be as coarse as possible within reason because finer grits require more bond which reduces thermal conductivity. Smooth finish on castings may be attained by use of a good plumbago wash.

* * *

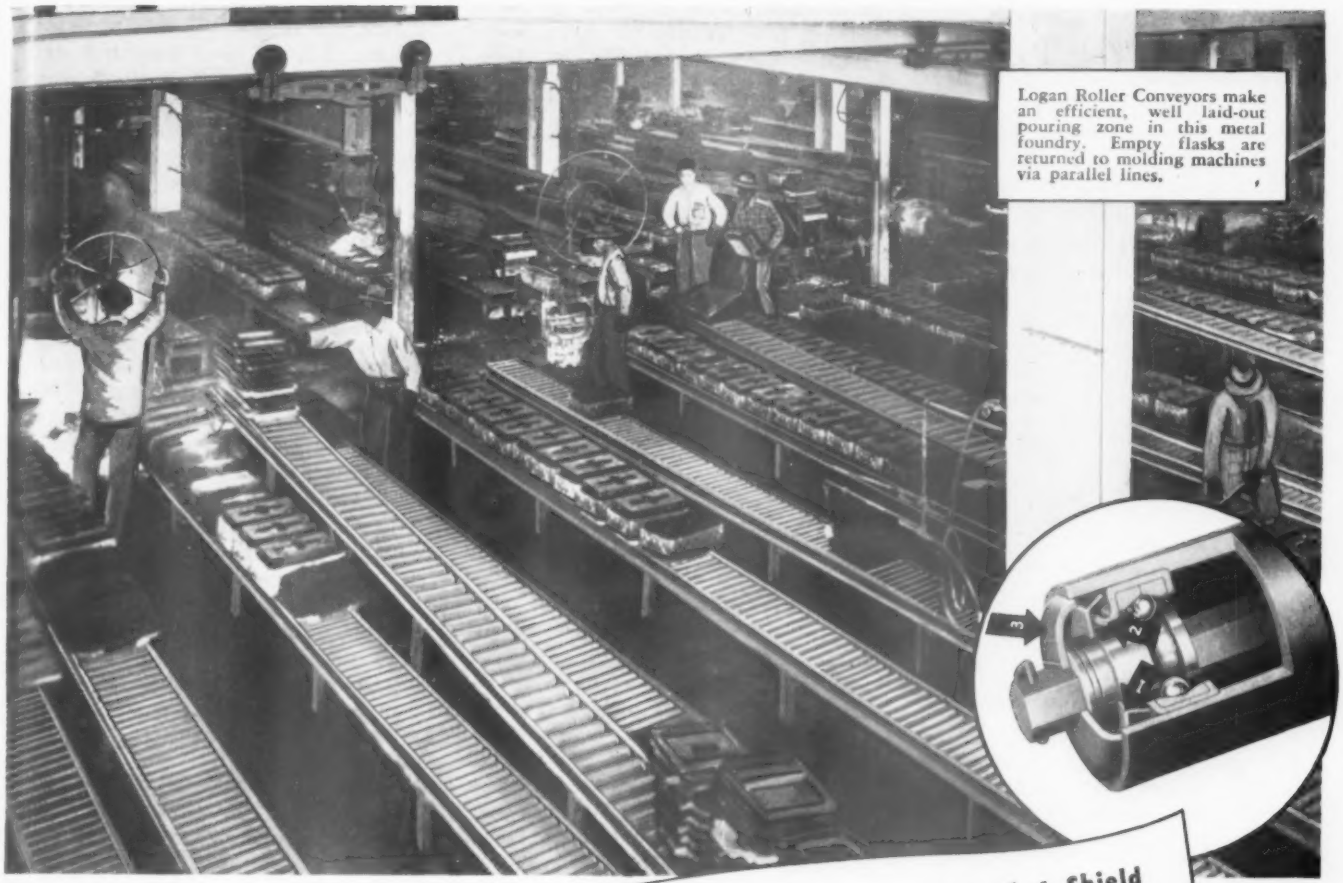
IN A STUDY of creep and creep-to-rupture tests at 850° F for periods up to 3500 hr on 12 heats of normalized low carbon steel of commercial manufacture, representing various refinining and oxidation practices, Smith and Dulis, U. S. Steel Corp., Kearny, N. J., found some interesting results. In the paper presented at the recent ASTM convention, the authors found that ignoring possible effect of differences in chemical composition and structure, the weakest of the open-hearth steels tested was that deoxidized with the greatest amount of aluminum, and the strongest was that deoxidized with silicon but no aluminum.

* * *

RESULTS of a study on the effect of blast humidity on cupola operation by D. E. Krause and H. W. Lownie Jr., Battelle Memorial Institute, were presented at the recent AFS convention. Work was conducted with a 10-in. diam cupola, and showed that an increase in moisture from 27 to 219 grains per lb air caused a loss of 135° F in tapping temperature, a reduction in carbon content of the iron from 3.45 to 3.17 per cent, increased losses of Si and Mn, lowered melting rate, and more oxidizing conditions within the cupola.

* * *

REPORTS from Kansas indicate that one foundry is adding liquid steel blown in a bessemer to cupola iron to obtain a higher strength material. Reminds one of J. E. Johnson Jr.'s experiments in 1917 to produce a foundry pig iron of exceptional quality by the same procedure. After remelting in the cupola the resulting iron showed much higher strength which he attributed to oxygen picked up from the bessemerizing operation.



Logan Roller Conveyors make an efficient, well laid-out pouring zone in this metal foundry. Empty flasks are returned to molding machines via parallel lines.

LOGAN Dust-Protected Bearing, with Shot Shield

The patented Logan Dust-Protected Bearing is most practical for use where dust, sand, iron filings or scale are present. Outer shield (1) is fixed to stationary inner race of bearing; does not touch any rotating part. Steel labyrinth seal (2) repells dust as roll revolves. The shot shield (3) is recommended for pouring zones. Rounded shape sheds splashed metal — prevents fouling. The shot shield remains stationary and has clean-out opening at bottom. Entire bearing assembly is set back from end of roll in protected position, revolves just as freely as a plain bearing because it has no felt washers.

It's Your Move....

Many authorities agree that "moving is 40% to 70% of making." Foundries certainly are no exception. What is *your* percentage?

As the nation enters a period of keen competition it is good business to check your moving (or handling) costs—then pare them to the bone. Logan can help you do this.

Two generations of experience qualify the Logan organization to serve you. Logan Foundry Conveyor engineering, design, and construction cost you no more initially and are your guarantee of trouble-free performance through the years, with a minimum of replacement and maintenance expense. Logan engineers "take the gamble out of handle." The next good move? Write today for literature.

CONVEYORS ARE PART OF THE PROCESS

Logan Conveyors

LOGAN CO., 580 CABEL ST., LOUISVILLE 6, KY.

Technical Reports

(*Continued from page* 91)

it was necessary to scrap $75,000 worth of pattern equipment that had been improperly stored, he said it was cheaper to replace than to repair it for production use. He said that the shelving for pattern storage which has been developed by the Caterpillar Tractor Co., Peoria, Ill. is the last word and he recommended it as a model for other shops.

Those who reported on having had experience in spraying metal on wood patterns stated that it had not proved too satisfactory and had been discontinued. In cases where inexpensive wood patterns were sprayed with metal for use under sandslingers, 40 castings was said to be about the maximum number which could be produced before the bond between the wood and metal would begin to break down.

The need for metal patternmakers was cited, and as a means of interesting more boys in the field, a metal patternmaking contest is being considered as a part of next year's annual apprentice contest of the AFS. It was stated that for the production of metal patterns men with a good background of wood patternmaking practice are far more satisfactory than machinists or toolmakers transferred to metal patternmaking.

L. F. Tucker, City Pattern & Foundry Co. Inc., South Bend, Ind., and H. K. Swanson, Swanson Pattern & Model Works, East Chicago, Ind., presided at the roundtable luncheon held by the pattern group on Wednesday noon. V. C. Reid, City Pattern Foundry & Machine Co., Detroit, spoke on "Shall Pattern Equipment Be Machined or Cast To Size", pointing out that much depends on the type of patterns and coreboxes involved. Where patterns are intricate, with thin walls, casting to size may not result in accurate dimensions.

Similarly, when numerous duplicate coreboxes and patterns are desired, machining will provide accuracy in dimensions. Also due to unpredictable shrinkage in pattern metals, machining is required to obtain accuracy. A. F. Pfeiffer, Allis-Chalmers Mfg. Co., Milwaukee, showed several slides of pattern equipment for large work which necessitated machining so that satisfactory castings could be produced. He mentioned that in some cases it was desirable to make the pattern in sections rather than integral so that worn parts could be replaced.

DISCUSSIONS ON GRAY IRON

Feature Metallurgical Subjects

GRAY Iron Division sponsored four technical sessions, one roundtable luncheon, and two joint sessions with the Malleable Iron Division and the Steel Division. Report on the joint meeting with the malleable group, relating to the production and properties of spheroidal carbon or nodular cast iron, was presented in the June issue.

Opening session was held Wednesday morning, with R. G. McElwee, Vanadium Corp. of America, Detroit, and Dr. A. E. Schuh, U. S. Pipe & Foundry Co., Burlington, N. J., as chairmen. First paper on "Effect of Boron on Structure and Some Properties of Plain Cast Irons" by A. I. Krynitsky, and H. Stern, National Bureau of Standards, Washington, was presented by Mr. Krynitsky. In investigating boron additions of 0.001 to 0.48 per cent to a series of plain gray irons, it was found that increasing boron increased the chill and undercooling effects and lessened the temperature difference between apparent liquidus and solidus. Increasing amounts of boron caused hardness to increase and the amount and size of the graphite flakes to decrease. With boron contents over 0.29 per cent the structure consisted of a matrix of cementite containing islands of pearlite and islands of a practically unresolved structure believed to be fine pearlite. The pearlite islands were surrounded by a structureless envelope believed to be ferrite.

In the discussion D. S. Clark, California Institute of Technology, Pasadena, Calif., mentioned that in irons containing 12 per cent boron the envelopes consisted of iron boride as determined by use of boiling alkaline etch, etc. C. O. Burgess, Gray Iron Founders' Society, Cleveland, stated that additions of 0.02 per cent boron to high-frequency melts give a decided chill reduction, but larger amounts increase the chill, and that the chill developed by boron tends to break down under heat.

Second paper on "Blast Humidity as a Factor in Cupola Operation," by D. E. Krause, Gray Iron Research Institute Inc., Columbus, O., and H. W. Lownie Jr., Battelle Memorial Institute, Columbus, O., was presented by Mr. Lownie, and described data gathered in operating a small 10-in. diam cupola with and without moisture control in the blast. When moisture in the blast increased, tapping temperatures and carbon pickup decreased significantly. For example, at a coke to iron ratio of 7½ to 1, and a blast rate of 12½ lb per minute, increase in the amount of moisture in the blast from 27 to 219 grains per lb of air resulted in an average loss of 135° F in tapping temperature, reduction in carbon content from 3.45 to 3.17 per cent, increased losses of silicon and manganese, lowered melting rate, and more oxidizing conditions within the cupola.

Increasing the amount of coke per split without a simultaneous increase in the blast rate did not compensate for the effects of high moisture in the blast. Increasing the amount of coke per split with a simultaneous increase in the blast rate tended to compensate partially for some of the effects of high moisture.

Present Exchange Paper

The second gray iron session featured two papers, one the exchange paper of the Institute of British Foundrymen, and a progress report by the Cupola Research Committee. T. E. Eagan, Cooper-Bessemer Corp., Grove City, Pa., presided, and R. Schneidewind, University of Michigan, Ann Arbor, Mich., was co-chairman.

The first paper, "Graphitizing Behavior of White Cast Iron," by S. C. Massari, technical director, American Foundrymen's Society, Chicago, reported on the behavior of iron of chilled car wheel composition, annealed at 1600 to 2000° F so as to complete first stage graphitization. The research was conducted while the author was associated with the Association of Manufacturers of Chilled Car Wheels.

Annealing was conducted under conditions such as to practically eliminate initial graphitization while the metal was being heated to nominal temperature. Experiments established the approximate time required to complete first stage graphitization and the type of graphite formed.

Mr. Massari demonstrated that there is a marked difference in the type of graphite precipitated within the limits investigated, dependent upon temperature at which first stage graphitization takes place. This change ranges from a true temper carbon, typical of malleable iron, to one of distinct flake form, characteristic of gray iron. Likewise, as

(*Continued on page* 122)

Roundness is so important!
ANNEALSHOT by Metal Blast
Here they are Again!
Don't Overlook.. these ANNEALSHOT
METAL BLAST, INC.
872 East 67th St. Cleveland 3, Ohio

The above lovelies appeared on Foundry's pages during the past few months—solely to call your attention to ANNEALSHOT, the new, conditioned shot that offers so many advantages over ordinary shot. During that time, many leading foundries tried ANNEALSHOT and found that it did better cleaning and peening, and reduced their operating costs besides. So here they are again—just in case you haven't yet tried ANNEALSHOT. If they didn't persuade you individually—perhaps they can together. Why not at least send for a trial order?

METAL BLAST, INC.
872 East 67th St. Cleveland 3, Ohio

ANNEALSHOT by Metal Blast

(*Continued from page* 120)

temperature rises, first stage graphitization progresses at an increasing rate, requiring as short a time interval as 2 minutes when annealing temperature is 2000° F.

It is believed, the speaker continued, that there are instances where this method of indirectly producing a gray iron may find application. The practical accomplishments under plant conditions offer some obstacles, such as rapid surface oxidation or scaling when metal is heated to these high temperatures, requiring an atmosphere controlled furnace. Distortion of the casting at these high temperatures may make it impractical where final dimensions are of primary importance. Also, furnaces operating at these high temperatures involve use of premium quality refractories and entail relatively high operating and maintenance costs. In certain isolated cases, where sections are symmetrical, such as a cylinder or a tube, the casting may be heated quickly and relatively economically by use of high-frequency induction.

In his progress report of the Cupola Research Committee, of which he is chairman, R. G. McElwee, Vanadium Corp. of America, Detroit, commented that foundrymen are less concerned about raw materials, consequently this matter is not being studied so intensively by the committee. The group continues to study slag conditions and has done further work on coke. Information on the latter, is available to those interested, but it is not of too general concern. Mr. McElwee announced that the committee has prepared for publication an article recommending the minimum laboratory for a gray iron foundry and has a revision of the Cupola Handbook under way.

The exchange paper of the Institute of British Foundrymen, titled "Properties of Cast Iron in Relation to the Carbon Equivalent Value," was authored by H. T. Angus, F. Dunn and D. Marles, British Cast Iron Research Association, Birmingham, and presented in abstract by Co-chairman Schneidewind.

First part of the paper described previous attempts to find a relationship between analysis of cast iron and its mechanical properties. Second part produced a diagram showing that the structure of a range of sections up to 1.5 in. diameter can be predicted approximately from the carbon equivalent value using as a basis five characteristic microstructures.

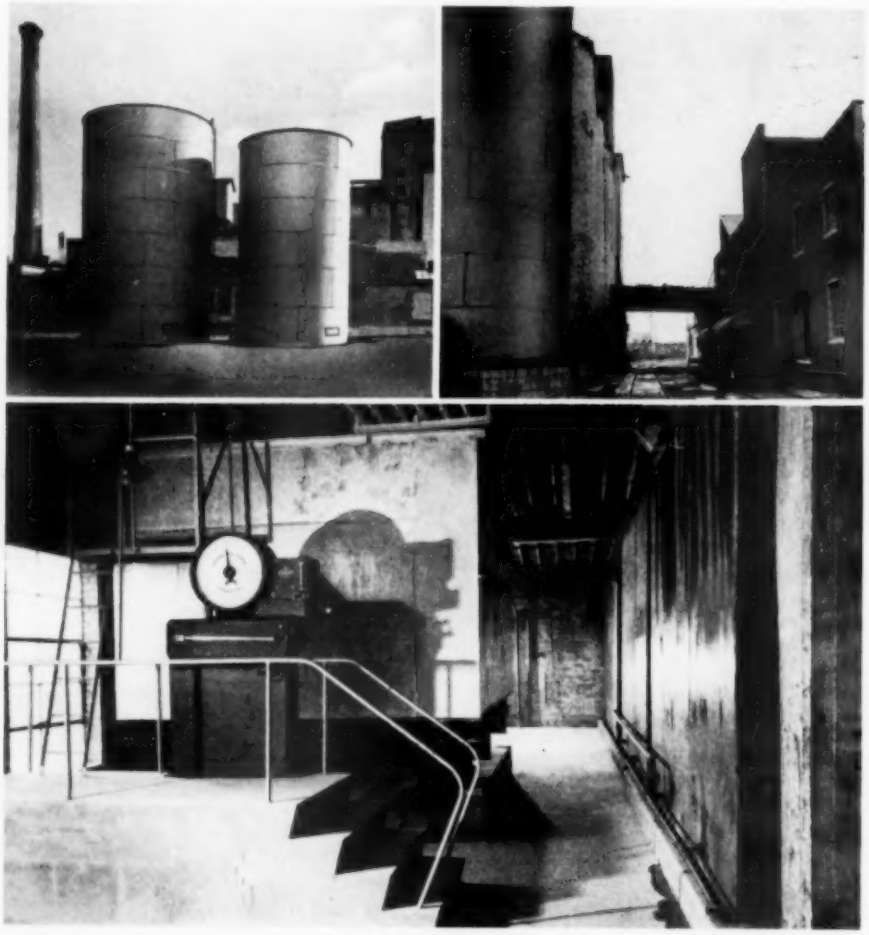
Volume Affects Cooling Rate

The authors showed effect of the volume-area ratio on cooling rate and strength and limitations of this method of calculation. Figures were given to show the heterogeneity of mechanical properties, even in compact sections, resulting from difference in speed of cooling, and importance of realizing the limitations of the carbon equivalent value was stressed. From point of view of the foundryman and designer, basic information on mechanical properties was given in several illustrations and although appreciable uncertainty exists at any given point, nevertheless, in aiming for a given strength of test bar, the curves showed the range of compositions most likely to yield required results.

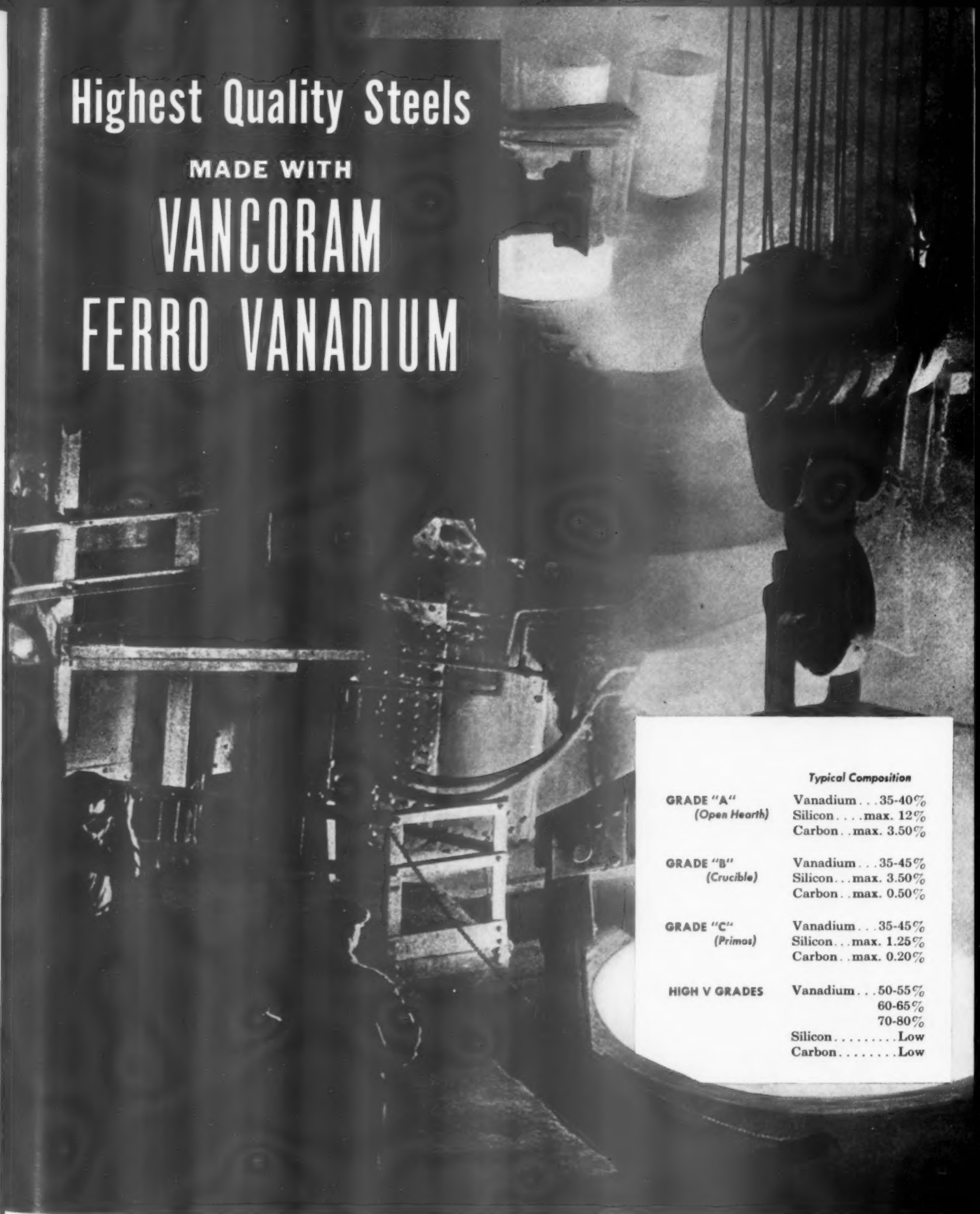
Two research papers, one the exchange paper of the Institute of Australian Foundrymen, comprised the agenda for the third Gray Iron session. Both dealt with metallurgical aspects of cast iron. Presiding was J. S. Vanick, International Nickel Co. Inc., New York, and G. P. Phillips, International Harvester Co., Chicago, was co-chairman.

Permanent growth in gray iron when subjected to alternate heating and cooling or prolonged holding at elevated temperatures has been the subject of many investigations, explained W. H. White, metallurgist, Jackson Iron & Steel Co., Jackson, O., in presenting the first paper, "Growth and Scaling Characteristics of High-Silicon Cast Iron," which he authored in collaboration with A. R. Elsea, assistant supervisor, Battelle Memorial Institute, Columbus, O. However, the speaker continued, there has been considerable

(*Continued on page* 124)



CORE OIL PLANT: Werner G. Smith Co., Cleveland manufacturer of core oil, has begun operations at its new plant in Milwaukee. Claimed to be the largest core oil plant in the world, the new factory contains the most modern up-to-date equipment obtainable for the processing of foundry core oils. From its oil storage capacity of several million gallons to its modern control laboratory, the Milwaukee plant has been designed for a production capacity of more than 1000 drums of core oil daily. Facilities are available for loading drums or tank-trucks, railroad cars or tank-cars. The company also operates plants in Cleveland and Toronto; the former will now serve foundries located between the eastern seaboard and Indiana, with the new Milwaukee plant servicing users to the west, northwest, southwest and, by lake shipment, in western Michigan



	Typical Composition
GRADE "A" (Open Hearth)	Vanadium . . . 35-40% Silicon . . . . max. 12% Carbon . . max. 3.50%
GRADE "B" (Crucible)	Vanadium . . . 35-45% Silicon . . . max. 3.50% Carbon . . max. 0.50%
GRADE "C" (Primos)	Vanadium . . . 35-45% Silicon . . . max. 1.25% Carbon . . max. 0.20%
HIGH V GRADES	Vanadium . . . 50-55% 60-65% 70-80% Silicon . . . . . Low Carbon . . . . . Low

VANADIUM CORPORATION OF AMERICA

120 LEXINGTON AVENUE, NEW YORK 17, N. Y. • DETROIT • CHICAGO • CLEVELAND • PITTSBURGH

MAKERS OF FERRO-ALLOYS

VANCORAM

CHEMICALS AND METALS

(*Continued from page* 122)
disagreement among investigators as to the actual mechanism of growth and as to the specific effect of silicon upon growth resistance.

It was stated that the investigation substantiated the theory that growth is the result of the metal yielding to stresses set up by irregular expansion and contraction encountered on heating and cooling through the critical temperature range. Apparently the presence of oxidizing gases is not necessary for growth to occur; however, if present, they will greatly accelerate growth by filling with oxides any small voids or cracks formed in passing through the critical temperature range. The voids, once filled with oxide, afford a barrier to any compressive forces that might be encountered on subsequent heating and cooling. A small but definite volume increase is caused by decomposition of carbides which are present either as massive particles or in form of pearlite.

High-silicon irons — approximately 6 per cent silicon—are able to resist growth at temperatures as high as 1650 to 1700° F since their lower critical temperature is about 1775° F and they are free from carbides, either massive or in form of pearlite.

Type and distribution of graphite flakes in the high-silicon cast iron apparently determine their resistance to scaling, Mr. White said. Castings containing normal flake graphite are very resistant to scaling while those containing modified graphite scale as readily as ordinary cast iron. Induction furnace melting of high-silicon iron tends to produce normal graphite, as do additions of approximately 1.25 per cent copper and 0.50 per cent chromium or 1.25 per cent copper and 0.50 per cent molybdenum to cupola melted irons.

Attempts to reduce brittleness of high-silicon cast iron by alloy additions within limits tested were fruitless. In fact, unalloyed high-silicon iron has better room temperature mechanical properties than any of the alloyed irons. This brittleness, however, was said to be not a serious problem if the castings are to be used at temperatures over 500° F, since at this temperature they become as resistant to impact as ordinary cast irons.

Final conclusion arrived at by the authors was that cast iron containing approximately 6 per cent silicon, 2.30 to 2.50 carbon and 0.80 per cent manganese can be made satisfactorily in the cupola. To obtain desired analysis by cupola melting, it is necessary to use a charge containing 6.5 per cent silicon, carbon as low as practical—near 1.4 per cent, and melt as rapidly as possible so as to hold carbon pickup to a minimum.

"Graphitization of Gray Cast Iron by Heat Treatment" was title of the exchange paper from the Institute of Australian Foundrymen. The third such paper from this organization, it was presented personally by its author, A. W. Silvester, chief metallurgist, Russell Mfg. Co. Pty. Ltd., Melbourne, Australia. The paper described detailed study of two gray cast irons which were subjected to heat treatments of various temperatures and times. Object was to determine the time which the combined carbon took to decompose at various temperatures and to compare graphitization rate of a cast iron of medium silicon content with one of high silicon content.

Tackles Graphitization Problem

Mr. Silvester emphasized that results of the investigation represent two cast irons of given composition, and therefore it would be incorrect to regard the conclusions as anything other than specific—certainly not general at this stage. The conclusions were as follows:

1. Change from the metastable system of graphite-iron carbide to the stable system of graphite-ferrite depends upon functions of time and temperature.

2. There is a maximum decomposition rate for the combined carbon and the formula $Fe_3C \rightarrow 3\ Fe + C$ proceeds to the right at an increased rate until all the iron carbide is decomposed.

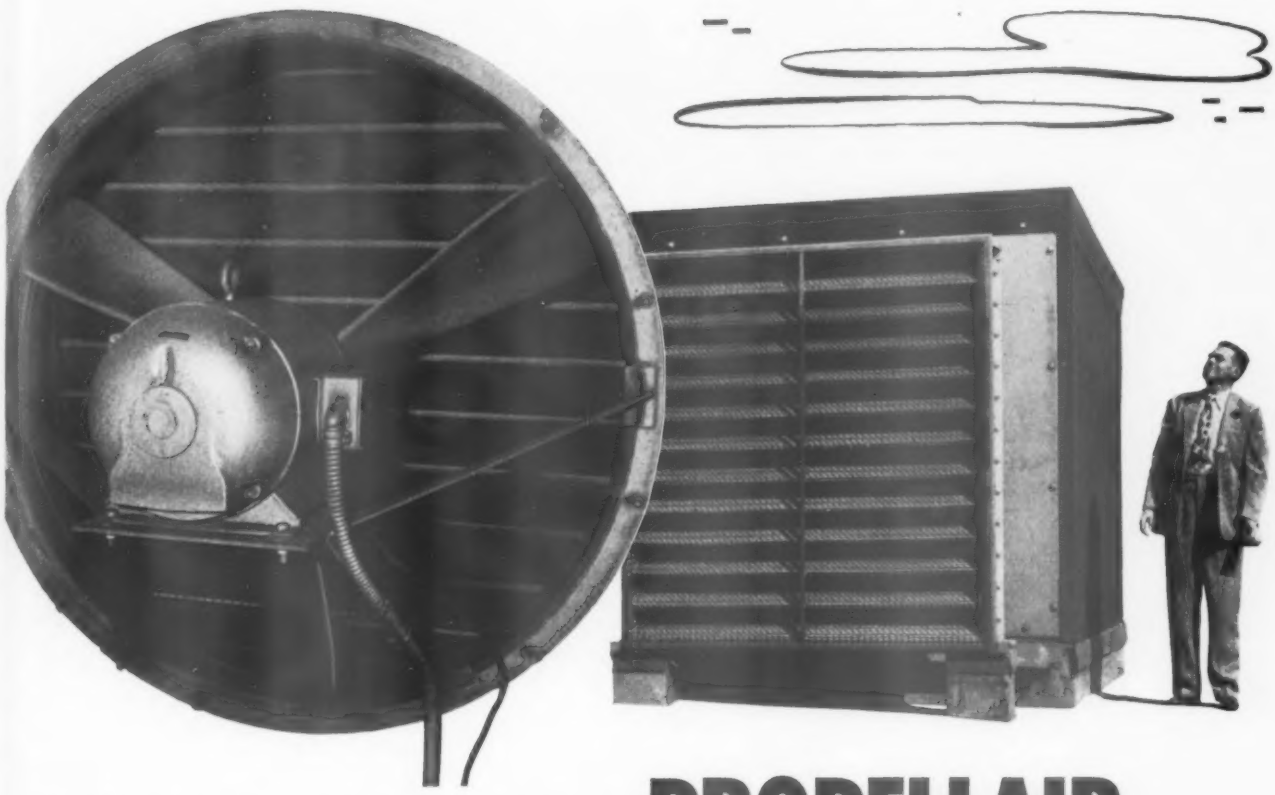
3. There appears to be a sharp line of demarcation at the higher temperatures where the combined carbon becomes stable and decomposition ceases.

4. Decomposition of the combined carbon proceeds at a progressively greater rate with an increase of temperature until a maximum rate is attained.

5. The curve of mean decomposition time of the combined carbon indicates that with the iron containing a higher silicon content: (a) Range of temperature over which the combined carbon readily decomposes is greater than for the lower silicon iron; (b) the curve is placed to the left, and the times during which decomposition takes place are shorter than for the lower silicon iron; (c) influence of the high-silicon content was less apparent at the

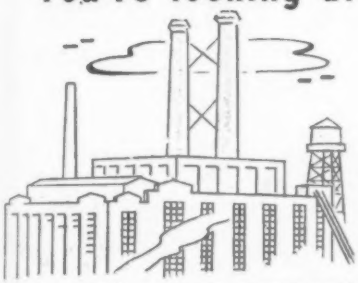
(*Continued on page* 127)

MALLEABLE DISPLAY: The Lake City Malleable Co., Cleveland, recently completed a comprehensive engineering exhibit of malleable iron casting processes and products. Installed in a strikingly decorated bus, the exhibit can be quickly transported to the plants of casting users and to educational institutions and other interested groups for inspection. In addition to many typical malleable iron castings, the display includes materials and tools used in the malleable iron foundry and explains production methods



You're looking at both sides of PROPELLAIR

. . . Showing Heat the Way Out!



Here's a powerful PROPELLAIR installation. Fan blades are 60" in diameter, powered by 15 h.p., 1150 RPM Robbins & Myers Uni-Shell motor. It's one of 12 atop this Eastern power plant. They're mounted in 9'-tall, metal penthouses where the fans exhaust through heavy-duty, automatic shutters protected by heavy grill work. Each 60" airfoil propeller moves 78,800 C.F.M., for a total air movement of 950,000 C.F.M. This is ample boiler and turbine room ventilation, even for peak loads.

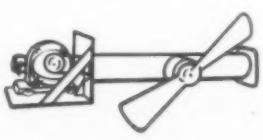
LEARNED FROM THE AIRCRAFT WING

More than just fans, Propellair airfoil blades create air movement with both sides . . . the back even more than the front. Like an airplane wing, air flow is uniform over full fan area because the whole blade works . . . not just the tip.

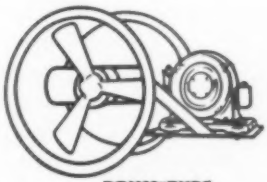
ADAPTED TO YOUR NEEDS

There are Propellair fans for every purpose . . . cooling men or machines . . . removing dust, fumes, odors, moisture, heat. Made for ducts, hoods, roofs, windows and with pedestals or stands. Sizes range from 12" to 60" diameter, with capacities up to 88,000 C.F.M. Several are shown below.

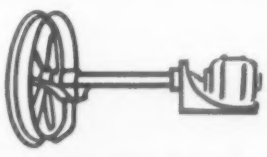
DISCUSS YOUR VENTILATING PROBLEMS WITH EXPERIENCED PROPELLAIR ENGINEERS. NO OBLIGATION.



DRUMLESS, FOR DUCTS AND STACKS



DRUM-TYPE FOR DUCTS AND STACKS



EXTENDED-SHAFT, PROTECTS MOTOR

DIRECT-CONNECTED, MANY USES

PROPELLAIR DIVISION OF ROBBINS & MYERS • INC.
SPRINGFIELD 92 OHIO
"Moving Air is our Business"

The alloying material that meets your specification exactly, or is best adapted for your intended use, put up in the most convenient form and shipped on time according to your schedule—that is what MCA recognizes as its obligation for.....

DEPENDABILITY

What you order, where you want it, when you need it—that, for your purpose, is what qualifies a.....

DEPENDABLE SUPPLIER

In view of this test, every effort will be made to meet your delivery requirement. On any intended use of Molybdenum, Tungsten, or Boron, correspondence is invited.

AMERICAN Production, American Distribution, American Control, Completely Integrated.

Offices: Pittsburgh, New York, Chicago, Cleveland, Detroit, Los Angeles, San Francisco, Seattle.

Sales Representatives: Edgar L. Fink, Detroit; Brumley-Donaldson Co., Los Angeles, San Francisco, Seattle.

Subsidiaries: Cleveland-Tungsten, Inc., Cleveland, O.; General Tungsten Manufacturing Co., Inc., Union City, N. J.

Works: Washington, Pa.; York, Pa.

Mines: Questa, New Mexico; Urad, Colorado.

MOLYBDENUM

CORPORATION OF AMERICA

GRANT BUILDING PITTSBURGH, PA.

MCA

(*Continued from page* 124)
lower temperatures.

6. At lower temperatures decomposition time becomes greater and therefore the combined carbon has greater stability.

Approximately 150 were present at the roundtable luncheon conference held by the Gray Iron Division Thursday noon with V. A. Crosby, Climax Molybdenum Co., Detroit, and C. O. Burgess, Gray Iron Founders' Society, Cleveland, presiding. Ray Collier, executive secretary, Gray Iron Founders' Society, spoke briefly, commenting that meetings of this type help make a better product and aid in the progress of the gray iron foundry industry. He stated that technical activities of the society would not conflict with those of AFS because numerous meetings were required to do a real job.

In the discussion period following the luncheon, with H. F. Taylor, Massachusetts Institute of Technology, Cambridge, Mass., as moderator, N. A. Birch, American Brake Shoe Co., Mahwah, N. J., presented the results obtained from a questionnaire sent to 450 foundries from which 62 replies were received. Questionnaire requested information on procedure for molding a 9-in. diam v-belt pulley to contain three grooves with one opposite the web joining rim to web.

Pulley Casting Methods Vary

Design was such that the hub of the casting could not be fed through the rim nor the rim from the hub. Casting weighed about 51 lb, and was to be made from 45,000 psi gray iron. Of the replies submitted 17 used a top center gate without riser; 7 used a center gate without riser; 24 used an edge gate with riser, 6 used an edge gate without riser, and 8 employed other methods than those mentioned. Recapitulation showed that 74 per cent recommended risers, and 58 per cent recommended gating through the riser.

Concluding gray iron session was held Thursday afternoon under the direction of W. A. Pennington, Carrier Corp., Syracuse, N. Y., and W. W. Levi, Lynchburg Foundry Co., Radford, Va. D. A. Gunther, National Radiator Co., Johnstown, Pa., discussed "Production and Consumption of Heat in the Cupola" by presenting a number of theoretical calculations relating fuel quality with cupola performance. These indicated the variations in melting rate with differences in fixed carbon content of the coke, carbon dioxide content in the effluent gas, temperature of the effluent gas, and radiation losses.

Final paper on "Design and Operation of a 10-in. Diameter Cupola" by D. E. Krause, Gray Iron Research Institute Inc., and H. W. Lownie Jr., Battelle Memorial Institute, was presented by Mr. Krause. It gave information on dimensions, method of lining, control features, etc., pertaining to the small cupola. The unit can melt 700 lb of iron per hour at 2800° F, and heats up to four-hours' duration have been made. While not expected to duplicate the operation in large commercial units in every detail, its operation does provide leads and trends which can be applied to the larger units.

SAND SHOP COURSE SESSIONS

Attract Large Audiences

A GROUP of approximately 500 were on hand Monday evening to participate in the opening session sponsored by the Sand Shop Course Committee. Chairman was R. H. Jacoby, the Key Co., East St. Louis, Ill., with Luther A. Kleber, General Steel Castings Co., Granite City, Ill., co-chairman. Subject discussed was "Causes of Penetration in Steel Castings," under the leadership of Earl E. Woodliff, Foundry Sand Service Engineering Co., Detroit.

Mr. Woodliff listed roughness, surface crust and pocket penetration as three forms of penetration for which sand is responsible. Listing on a blackboard 18 sand characteristics which govern the quality of a casting, he proposed that the group consider all the points and attempt to determine the most ideal combination of these characteristics which under most circumstances would eliminate metal penetration.

After a lively discussion, the following conclusions were reached: Zirconite sand seemed to be preferred because of its greater fineness and density; also zirconite mold washes were favored. Cores from which the oil binder is completely oxidized was an important point. As an example, one case was related where cores for steel castings were baked the customary length of time only to have defective castings result. The cores for these castings were then baked for 20 hours in addition to the regular baking time and the castings were perfect. It was generally agreed that sand mixtures having low expansion and medium green and hot strengths are best suited to the production of steel castings.

The subject of permeability developed considerable discussion and the range of 90-125 was finally agreed upon; however, the sand's grain fineness and distribution should be taken into consideration. Additional sand specifications designated include a five-screen grain distribution, high rammed density and high flowability.

In discussing the necessity of using mold washes, it was pointed out that one steel foundry has eliminated this phase of mold preparation as well as the use of silica flour. Specifications of its mold facing sand were listed as: Grain fineness, 65-70; three-screen distribution; permeability range, 70-105; compression strength, 12 lb, and a density factor of 108. With respect to permeability, it was stated that little concern is shown if it drops below 70; however, steps are taken immediately to remedy the situation if it goes over 105.

Frank Brewster, Harry W. Dietert Co., Detroit called the second session of the sand shop course to order. The speaker, T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va., discussed his company's experience in use of resin binder for production of cores.

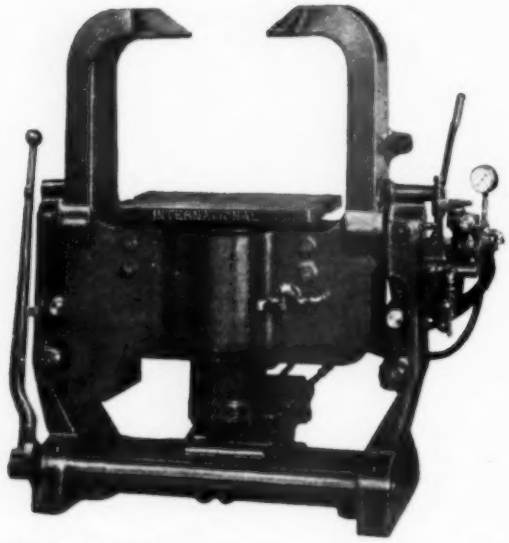
Mr. Curry stated that the company's reasons for beginning the use of resin binders were to improve the chemically treated molding sand used by changing the core sand that was introduced into the system at the shakeout, and to increase core oven baking capacity. In addition, it was believed that many scrap losses in the foundry which could not be traced to other factors were caused by improperly cured cores.

Approximately two years were spent in research work on resin binders before they were tried in production. In developing the correct proportions of resin binder, the amounts were limited to provide a cost comparable to that of core oil mixtures. It was found that a tensile strength of 80 pounds would work satisfactorily.

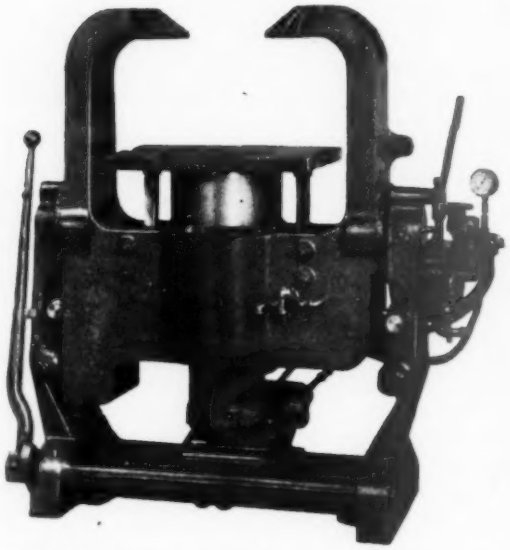
Since expense of resin binders is an important factor, close control is necessary, and weight rather than volume was found to be the preferred basis of control. Baked strength increases with higher percentages of water in the mixture; however, with use of 2.5 per cent water, the mixture has a tensile strength just under 100 psi and stickiness in the corebox is eliminated. Green cores are sprayed with a 15° Baume blacking solution to increase surface hardness, after

(*Continued on page* 130)

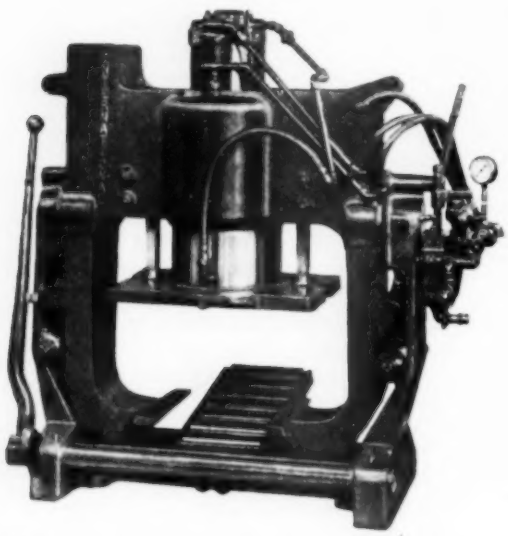
OPERATING CYCLE OF THE RES MACHINE



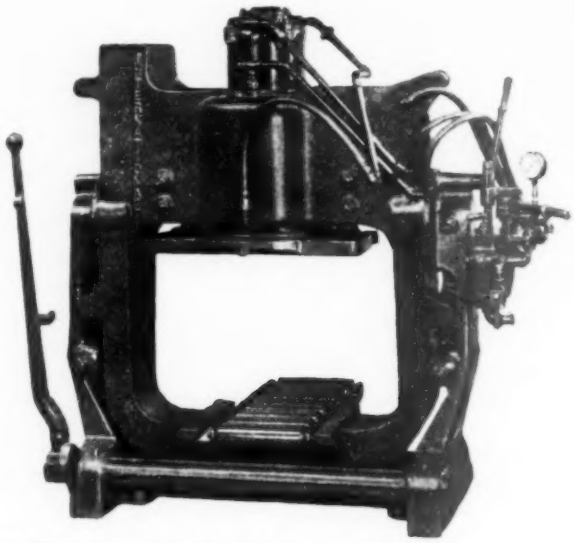
1 JOLTING POSITION . . . ready for flask, sand and jolting. Strike-off and place bottom board on sand.



2 SQUEEZE POSITION . . . actuation of squeeze valve raises squeeze piston, thereby squeezing the mold and clamping the bottom board and flask into one integral unit, ready for rollover.

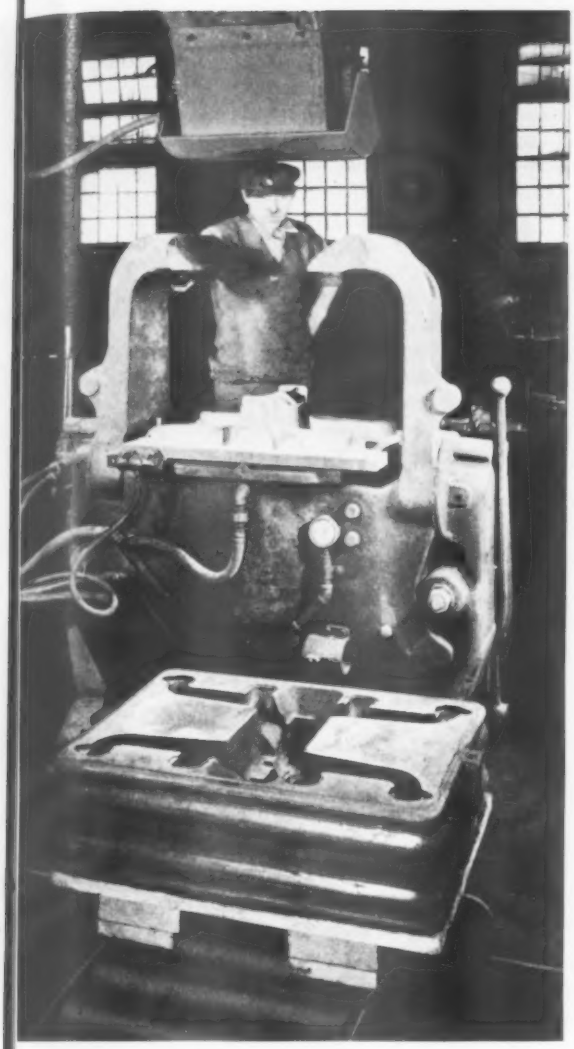


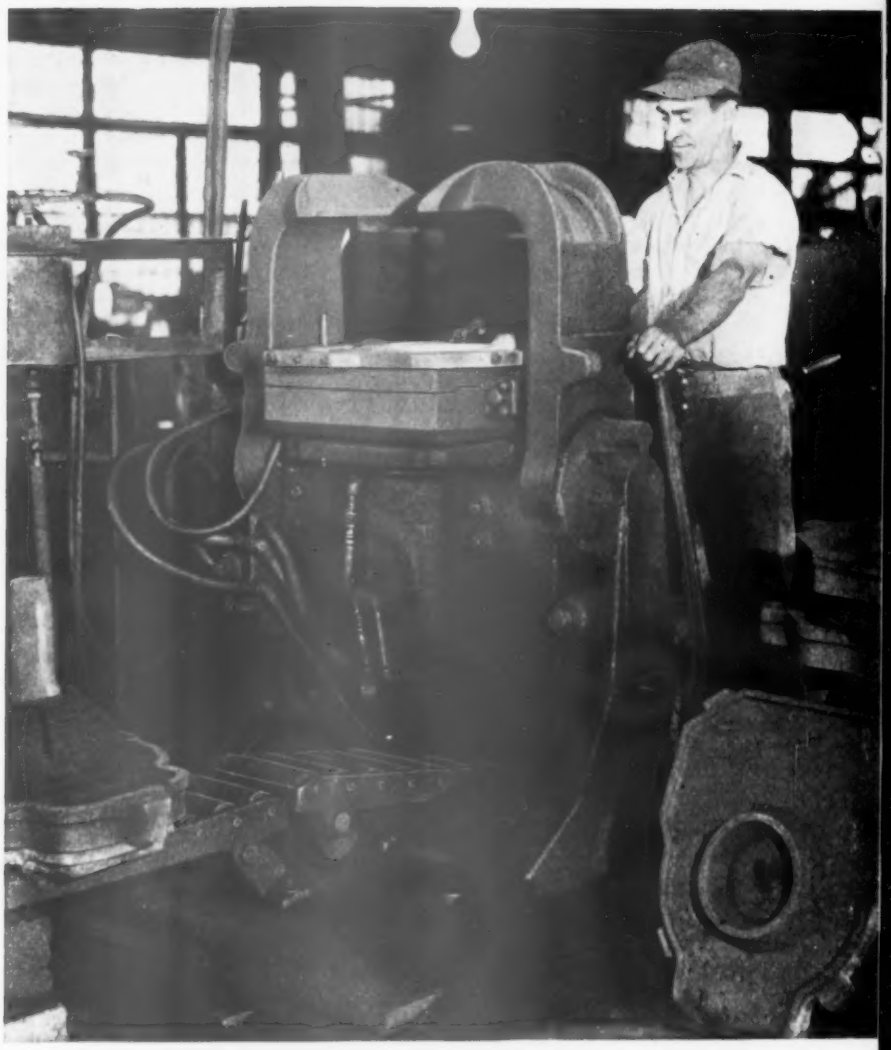
3 ROLLOVER POSITION . . . a slight pull of rollover frame by hand, rolls the machine over ready to operate the draw.



4 DRAW POSITION . . . by actuation of the vibrator valve and draw valve, the pattern is drawn from the mold. Rollers are then raised and mold pushed out by foot.

INTERNATIONAL





Features of the Type RES Machine

The fastest type Jolt, Squeeze, Rollover, Draw Machine.

Draw is always true because of integral frame and draw feature.

Completely above floor line . . . no pit necessary.

Engineered for ease of maintenance.

The **Type RES** is designed, as are all machines in the INTERNATIONAL LINE, by experienced foundry engineers who have a practical working knowledge of the problems of the business.

Inquiries should specify maximum outside width and length of the largest flask to be used, including trunnions and handles, allowance required for depth of flask, pattern plate and bottom board and amount of draw required.

MOLDING MACHINE COMPANY

LA GRANGE PARK, ILLINOIS

(*Continued from page* 127)

which the cores are baked at 325 to 350° F for 45 minutes.

Mr. Curry stated that resin bonded cores offer these advantages: Excellent finish and absence of veining; good collapsibility, and relatively short baking time. In reclamation it has been found that used sand, regardless of whether it previously had been bonded with resin or oil, can be rebonded with resin, and cores of the same physical properties are obtained.

In the discussion period one foundry reported that in its practice, 5 to 5.5 per cent moisture is used and the surface hardness is sufficient without spraying the cores. The molten steel lies quietly against these cores.

At the concluding sand shop course session Herbert Schutzenhoffer, Key Co., East St. Louis, Ill., discussed "Core Sand Blowing Practices." F. S. Brewster, Harry W. Dietert Co., Detroit, presided.

Mr. Schutzenhoffer described operations at his company where wood coreboxes are used with good results for blowing cores. He stated that boxes used for such purpose should be well made, preferably of mahogany, strongly glued and screwed, and equipped with a brass top plate. Surfaces should be parallel and blowholes and vents of proper size, with blowholes placed away from high spots and vertical walls in the box cavity. The ratio of vent area to blow area is five to one.

The company uses the same sand in its coreblowing machines as is used for bench work. They have found it unnecessary to reduce the moisture content of the sand for use in machines to increase flowability. Two grades of wood flour mix and one oil mix sand are used. Sand is 44 AFS grade. One of the wood flour mixes has moisture content of 7.6 per cent, green compression strength of 3.7, green permeability of 65 and density of 107. The other has moisture of 6.3 per cent, green compression 3.7, green permeability 85, and density 109. The oil mix has moisture content 4.2; green compression 2.1; green permeability 120, and density 109.

Disscussion brought out the fact that the company does not use core rods in the cores it makes for brass and bronze castings. The weakest sand used has a tensile strength of 80-90 psi.

PROGRAM OF STEEL DIVISION

Comprises Seven Papers

METALLURGICAL aspects of steel castings were the basis of three papers at the first of four steel sessions sponsored by the AFS Steel Division. Presiding was Charles Locke, Armour Research Foundation, Chicago, with C. H. Lorig, Battelle Memorial Institute, Columbus, O., as co-chairman.

A new metallographic etching reagent developed for cast alloy steels and its use were described by Edward A. Loria, fellow, Mellon Institute of Industrial Research, Pittsburgh, in a paper entitled "Note on As-cast Structure and Grain Size in Cast Alloy Steels." In the absence of the author, the paper was abstracted by Chairman Locke. The reagent and technique have been used successfully to illustrate the as-cast austenite grain size in such steels which do not develop ferrite outlining of the austenite grains formed at a very high temperature during or shortly after the freezing of the steel casting. Basically the etchant consists of 2 parts of concentrated nitric acid and 1 part of concentrated sulphuric acid in 2 parts of water.

According to the author, results obtained with the modified nitro-sulphuric reagent on samples of three cast steels reveal large polygonal grains and the dendritic pattern developed on solidification. Rate of chemical attack of the reagent varies with orientation of the as-cast austenite grains (or rather the products of their subsequent decomposition) and produces a typical grain contrast etch.

The number of as-cast grains in the central area of an etched cross-section for each steel was counted and the average grain area compared with ASTM grain size developed on reheating at 1550 and 1700° F. Confirming earlier results on steels which possessed ferrite outlines of the initial austenite grain boundaries, it was found by Mr. Loria that there was no apparent relationship between the original and subsequent grain size developed in these steels.

"A New Method for Determining Austenitic Grain Size of Cast Steel" was the subject of a paper by E. J. Eckel, associate professor of metallurgical engineering, University of Illinois, Urbana, Ill., and S. J. Paprocki, formerly a graduate student at the university and now associated with Battelle Memorial Institute, Columbus, O. The paper, presented by Prof. Eckel, described a method for determining austenitic grain size that is based on the intergranular diffusion of bronze into steel at elevated temperatures. The method, it was pointed out, requires neither special apparatus nor difficult techniques, takes little time and gives results that are generally superior to those obtained by other methods.

The authors concluded that the diffusion method for determining austenitic grain size is superior to methods now in use for the following reasons: (1) it gives a clearer microstructure and is therefore easier to evaluate; (2) it gives satisfactory results for a wide range of steel compositions and austenitizing temperatures; and (3) procedure is the same regardless of composition or hardenability of the steel.

Prevent Hot Tears

Principal defect in production of centrifugally-cast steel tubes (gun tubes) at Watertown Arsenal, Watertown, Mass., has been the radial hot tear. The tears are initiated at the outside surface and penetrate radially toward the bore of the casting and usually extend longitudinally or in a spiral direction around the casting. Since occurrence of these defects resulted in rejection of castings, considerable thought has been devoted to the mechanism of formation and means of prevention.

In a paper, "Prevention of Hot Tears in Thick-Walled Centrifugally Cast Steel Tubes," J. F. Wallace and J. L. Martin, metallurgist and director, respectively, of the arsenal laboratory, described a study of the problem. Consideration had already led to the conclusion that these hot tears are caused by internal pressure of the molten steel (under action of centrifugal force) acting against the solidified outer shell of steel. This outer shell shrinks away from the supporting mold wall through solidification contraction and has low strength and insufficient ductility to permit yielding at the higher temperatures. Internal pressure of the molten steel must, then, be kept below the breaking strength of the outermost solidified shell if hot tears are to be avoided.

Mr. Wallace explained that a satisfactory centrifugal casting technique requires accurate balancing of the more important variables such as the rate of pour, rate of transverse solidification, strength of the solidified shell or cylinder and speed of rotation. Experimental results (confined to casting in horizontal axis machines

(*Continued on page* 132)

Quantity
PRODUCTION
of
GREY IRON CASTINGS

*

ONE OF THE NATION'S
LARGEST AND MOST MODERN
PRODUCTION FOUNDRIES

*

ESTABLISHED 1866

THE WHELAND COMPANY

FOUNDRY DIVISION

MAIN OFFICE AND MANUFACTURING PLANTS

CHATTANOOGA 2, TENNESSEE

(*Continued from page* 130)
utilizing chill molds) emphasized that a speed of rotation within definite limits must be employed.

Mathematical expressions for the numerous variables involved were developed, utilizing some simplifying assumptions, Mr. Wallace continued. A single equation resulting from combining of these expressions, he said, may be applied to compute maximum rate of pour possible without hot tearing at any time during the casting cycle for a given size tube and speed of rotation. These data, which were presented graphically, may be used to establish casting practice to obtain satisfactory tubes free from hot tears and associated defects. Casting experience at Watertown Arsenal was said to indicate that some adjustments must be made in application of the mathematical analysis to prevent introduction of appreciable errors by the assumptions.

In discussion, C. K. Donoho, chief metallurgist, American Cast Iron Pipe Co. Birmingham, Ala., stated his company encounters problems similar to Watertown Arsenal although it casts cylindrical rather than tapered tubes. It also has developed and applied mathematical formulas as a means for preventing hot tears.

First paper in the second steel session, entitled "Fast Analysis of Acid Slags," by E. C. Zuppann, Wilson Foundry & Machine Co., Pontiac, Mich., and A. E. Martin, University of Minnesota, Minneapolis, was presented by Mr. Zuppann. Edward Berry, Dodge Steel Co., Philadelphia, presided, with C. Wyman, Burnside Steel Foundry Co., Chicago, as co-chairman of the session.

The paper describes work of the authors in developing a rapid method of analyzing acid slags to determine the contents of iron oxide, manganese oxide and chromium. The quantitative analysis, requiring less than 5 minutes, is accomplished by reflective spectrophotometry and is said to be more accurate than other rapid methods.

Chemical analysis is accurate but slow, an FeO analysis requiring one hour. Two rapid methods which have been used extensively are fluidity testing and visual color examination, although they are inaccurate. The authors concentrated their efforts on development of the color method.

Their work involved examination of acid slags of different analyses in a spectrophotometer and correlation of the resulting absorption curves with chemical compositions of the slags as determined by standard chemical methods. Samples are examined in a spectrophotometer either by transmitting light through them or by reflecting light from them. Since no rapid means of preparing slags for examination by the former method is known the second method was utilized.

Slag samples were ground and screened. The minus 100 plus 325 mesh material was mixed with a small amount of heavy Shiliber's oil and the sample placed on a thin crown glass and squeezed with a flat cover glass, preparatory to examination with the spectrophotometer.

In answer to a question, Mr. Zuppann stated that the spectrophotometer costs $1100 plus $200 for a light reflecting attachment. Mr. Zuppann also commented in answer to another question that the test had not been used as yet in routine procedure at a plant.

S. L. Gertsman, Canadian Bureau of Mines, Ottawa, presented the second paper, "A Study of Insulating and Mildly Exothermic Antipiping Compounds Used for Steel Castings." Mr. Gertsman conducted a series of tests with insulating or mildly exothermic compounds used to cover open risers to prevent radiation of heat to the atmosphere which might result in premature freezing-over of the riser.

The tests were designed to provide information on the thermal characteristics produced in the riser metal, the minimum size of riser that can be used for a standard casting, the type of shrinkage cavity produced in the riser, and the length of time required for the top of the head to freeze over. Mild steel produced by induction melting in basic lined crucibles was used for the tests.

Increase Feeding Time

The standard casting was a cylinder 3½-in. in diam and 3½-in. high with a 4½-in diam riser. Casting was gated through the bottom. Tests were conducted with risers 1, 2, 3 and 4 in. in height. Four ounces of each compound, forming a layer ½ to ¾-in. thick on the riser, were used except for one compound which required 8 oz to make a layer ½-in. thick. The other exception was oat hulls, 4 oz of which made a 2¼-in. layer.

Test results indicated that the use of such compounds increases the length of time that atmospheric pressure can act on risers. The materials kept the riser open for periods varying from 4 to 9 minutes while the riser on the test casting on which no compound was used skinned over in 30 seconds. The compound containing chloride salts, irreducible oxides, small quantity of carbonaceous matter and some iron oxide, and the one containing nitrate salt, aluminum, carbonaceous matter, irreducible oxides and some iron oxide gave the best results when used on castings having 2-in. high risers. Complete directional solidification from the casting toward the top of the riser was not achieved in any of the tests.

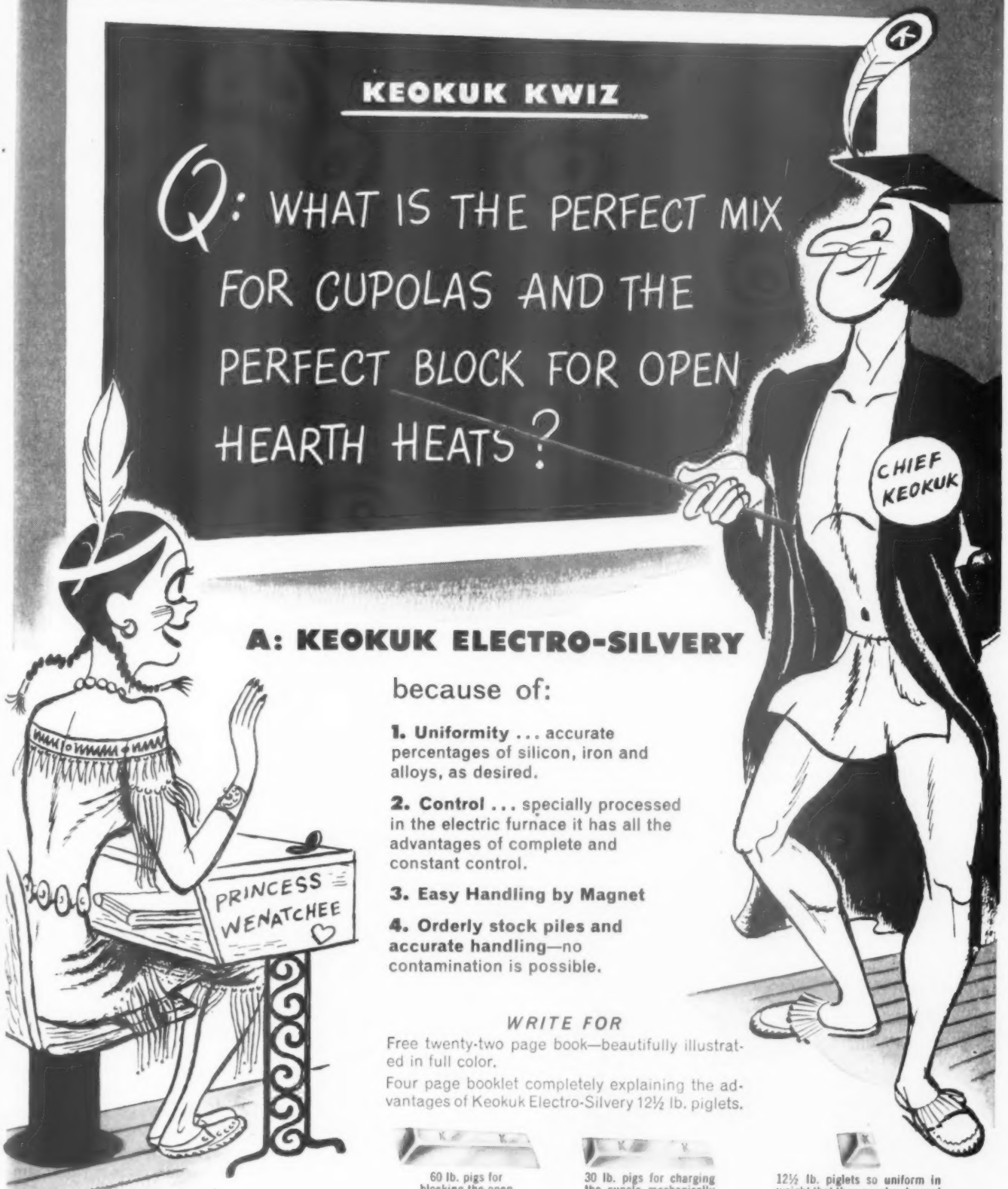
Discussion brought out that the author's findings have been verified in production operations at various foundries. It was further pointed out that smoke and fumes given off by some of the compounds have not been found to be harmful. Mr. Gertsman also pointed out that the compounds are placed on the metal as soon as it

(*Continued on page* 134)

INVESTMENT CASTING has been added to the activities of Crucible Steel Co. of America's Spaulding Works at Harrison, N. J., as part of the company's million dollar expansion program now underway. The accompanying photo shows metal being poured into investment molds in the new department

KEOKUK KWIZ

Q: WHAT IS THE PERFECT MIX FOR CUPOLAS AND THE PERFECT BLOCK FOR OPEN HEARTH HEATS?



A: KEOKUK ELECTRO-SILVERY

because of:

1. Uniformity ... accurate percentages of silicon, iron and alloys, as desired.

2. Control ... specially processed in the electric furnace it has all the advantages of complete and constant control.

3. Easy Handling by Magnet

4. Orderly stock piles and accurate handling—no contamination is possible.

WRITE FOR

Free twenty-two page book—beautifully illustrated in full color.

Four page booklet completely explaining the advantages of Keokuk Electro-Silvery 12½ lb. piglets.

60 lb. pigs for blocking the open hearth heat.

30 lb. pigs for charging the cupola mechanically or by hand.

12½ lb. piglets so uniform in weight that they may be charged into the cupola by hand.

60-lb. pigs for steel plants

30-lb. pigs and 12½-lb. piglets for foundries.

KEOKUK
electro-silvery

BY KEOKUK ELECTRO-METALS COMPANY
KEOKUK, IOWA

WENATCHEE DIVISION, WENATCHEE, WASHINGTON

SALES AGENTS: Miller and Company — 332 S. Michigan Avenue, Chicago 4, Illinois — 3504 Carew Tower, Cincinnati 2, Ohio — 407 N. Eighth Street, St. Louis 1, Missouri

(*Continued from page* 132)
reaches the top of the riser.

At a joint evening session of the Gray Iron and Steel Divisions under the direction of Howard F. Taylor, Massachusetts Institute of Technology Cambridge, Mass., and T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va., two interesting color motion pictures were presented. Prepared by William H. Johnson and William O. Baker, Naval Research Laboratory, Washington, the films are a continuation of earlier work and depict the flow of molten steel at 3000° F through finger and step gates.

In finger gating the main runner was located in several positions, such as at an angle of 45°, with the branches perpendicular to the casting; with the runner divided to form a vee with the point toward and away from the casting; with the runner tapered, etc. In the first case the metal tended to flow mainly through the last branch, and with the runner tapered so that the small end was at the last branch, the metal squirted into the mold cavity. With the divided runner having the point toward the casting cavity, the metal flowed through the two branch gates on either side of the point; while with the point away from the casting, the metal flowed through the two end branches.

Similarly, with step gating several different types were used, such as tapered sprues with the big end up, and down; with the bottom branch steeply inclined upward; with the steps curved upward, and downward. With sprues big end up feeding from top branches was secured, but it was premature, while with the sprues big end down no feed was secured from the top branches. Best systems of step gating were with the bottom step steeply inclined and the two upper steps radiating from a common junction; and one applying the reversed flow condition with a pool at the bottom of the downgate, and a taper in the reversed sprue. In addition to producing more nearly true sequence of flow, it permitted the metal to enter the mold quietly.

At the final steel session, presided over by R. E. Kerr, Pettibone Mulliken Corp., Chicago, with G. W. Johnson, Vanadium Corp. of America, Chicago, as co-chairman, C. E. Sims presented a paper on "Effect of Various Deoxidizers on the Structure of Sulphide Inclusions," which he prepared in conjunction with H. A. Saller and F. W. Boulger, Battelle Memorial Institute, Columbus, O.

The study represented an attempt to get experimental evidence regarding various deoxidizers for steel. Eighteen heats of low-carbon scrap charges melted in an induction furnace with a magnesia lining were used in the study. Some ferromanganese, ferrosilicon, and iron pyrite were melted with the charge. Alloy additions of silicomanganese, ferrosilicon, ferromanganese, and graphite were made in all but three heats within 2 minutes after the charge was melted.

A casting was poured one minute after the final alloy addition to represent the base composition of each heat. Then additions of the particular element under study were made to the furnace and another casting poured. Nine to twelve ingots were poured from each heat to study the effect of a particular element.

Relative deoxidizing powers of the elements studied were found to be as follows: Aluminum and zirconium about equal, then titanium, boron, silicon, vanadium and manganese in descending order. Magnesium was found to have some deoxidizing power, but difficulties in its use make it impractical. Calcium showed no deoxidizing effects. Small additions of aluminum, zirconium, titanium and magnesium produced type II sulphides, and boron produced larger sulphides resembling type II. Type I sulphide inclusions were produced by silicon, manganese, and vanadium. Type III sulphides were found only in steels containing residual amounts of aluminum or zirconium, but, under certain conditions, such as for very low carbon or silicon contents or too large aluminum content in medium manganese steel, aluminum failed to produce type III sulphides.

And finally, the insoluble aluminum in aluminum treated steels was found to be constant at about 0.006 per cent.

Aluminum Increases Strength

Concluding paper in the steel sessions, "Effect of Aluminum and Vanadium on the Toughness of High Hardenability Cast Steel," was presented by J. F. Wallace, Watertown Arsenal, Watertown, Mass. Mr. Wallace presented the results of a study of the effect of aluminum and vanadium, when used as grain refiners, on the toughness of fully quenched and drawn samples from three cast steels of high hardenability.

Impact test data of the aluminum and vanadium refined ingots from the same heat at equivalent strength levels indicated that aluminum imparts superior toughness to the low and medium manganese steels, and that vanadium gives better impact resistance to the high manganese heat. It also was shown that the difference in toughness produced by using either aluminum or vanadium as grain refiners decreases as the hardness increases for all three steels.

The steel producing the best toughness record was the medium-manganese, nickel, molybdenum steel followed closely by the low-manganese, chromium, nickel, molybdenum steel with the high manganese, chromium-molybdenum steel appearing unde-

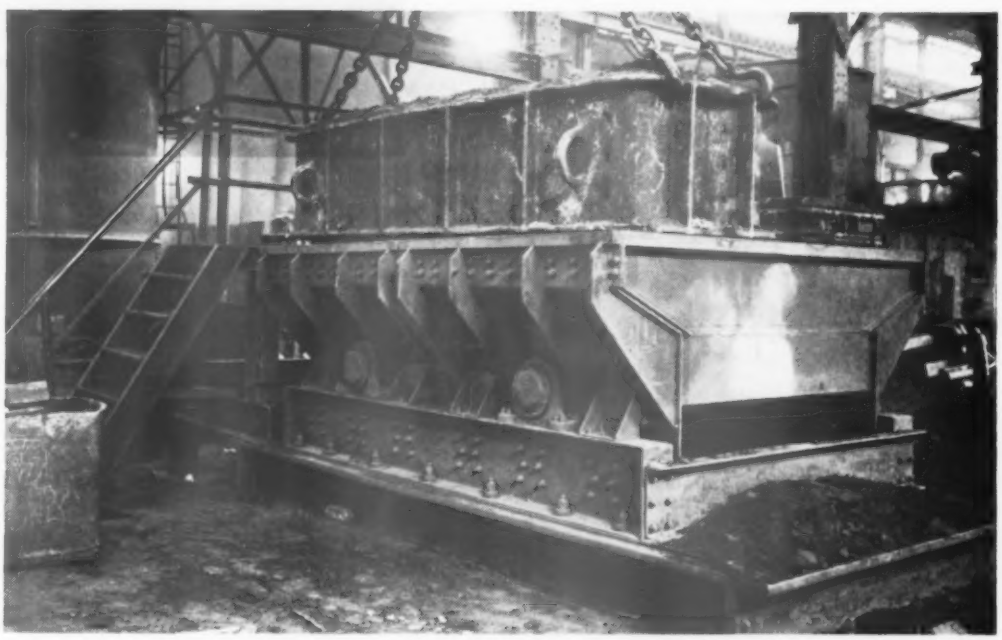
(*Continued on page* 137)

SLICING IRON: Cast iron machine bases, weighing 100 tons each, were powder-cut to five smaller-size pieces by Illinois Equipment Co., Chicago, using an oxy-acetylene cutting blowpipe developed by Linde Air Products Co., New York. The cuts measured about 43 in. thick, 100 in. long at the base and 95 in. at top. Time of cut averaged 1 hr, and the speed was as great as 4 in. per minute during some portions of the cut

When You Want Both FLASK SHAKEOUT and CORE KNOCKOUT

With One Machine . . .
In One Operation

pick SIMPLICITY as 800 foundries have during the past 15 years!



● It is nothing new to owners of Simplicity Shakeouts. Whenever they wish to shakeout castings and knockout cores in a single operation they can do it with a Simplicity—and they have been doing it with a Simplicity for the past 15 years! Shown here is a typical Simplicity Shakeout, a Heavy Duty 8 x 10 unit in operation. Our engineers will gladly recommend the proper Simplicity Shakeout for your foundry operations on receipt of your specifications.

- SALES REPRESENTATIVES IN ALL PARTS OF THE U. S. A.
- FOR CANADA: CANADIAN BRIDGE ENGINEERING CO. LTD., WALKERVILLE, ONTARIO
- FOR EXPORT: BROWN & SITES, 50 CHURCH ST., NEW YORK 7

implicity
TRADE MARK REGISTERED

ENGINEERING CO., DURAND, MICHIGAN

SOFFEL'S
New THERMOTOMIC-X
(PATENTED)

exothermic metal feeding compound

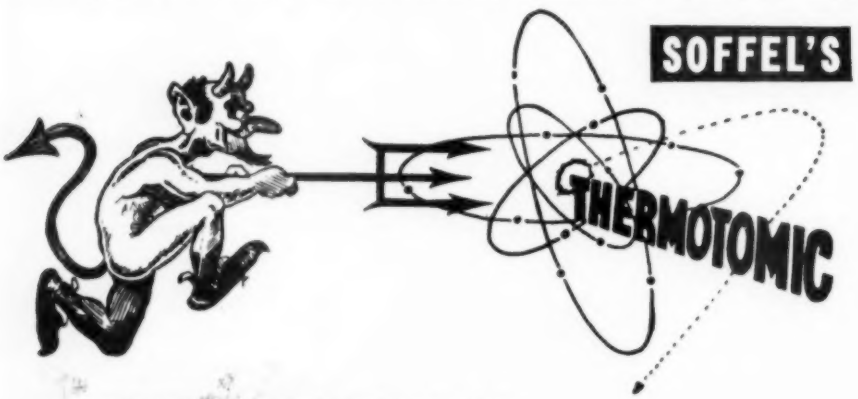
✓ Cuts casting costs

✓ Makes Better Castings

FOR STEEL, STAINLESS STEEL, GRAY OR MALLEABLE IRONS, COPPER, BRASS, BRONZE AND ALUMINUM

NEW THERMOTOMIC X

A new, improved, hotter and faster acting THERMOTOMIC X will increase temperatures and fluidity in the risers without bubbling and boiling. A means of introducing heat energy into the feeding metal in the heads or risers of castings or at other localized points in the mold by the use of inserts or as a facing. Increased yield by the reduction of heads, control of directional feeding and the elimination of scrap due to piping, porosity and shrinkage are the results to be obtained by the use of this patented compound.



Reduces Size of Risers and Feeder Heads

Heads and Risers Removed without Cutting and Burning

Increases Yield

Eliminates Shrinkage and Piping in Castings

WHAT IS THERMOTOMIC?

Thermotomic Compound is an exothermic material which can be molded and baked into any desired shapes just as sand cores are made. It produces a temperature of 3500° F. It is used as ring inserts under the risers or feeding heads, or as facing inserts where it is desirable to maintain the fluidity of the metal in the mold at those points where rapid cooling may cause piping, shrinkage or segregation. Great savings are realized through reduced riser dimensions and cleaning costs. For use in green sand molds, use Thermomotic WP (waterproofed). Soffel's Carbon-Free Liquidizer No. 5 is recommended for use with Thermotomic feeding compounds on top of the feeding heads.

SOFFEL'S CARBON-FREE LIQUIDIZER

For feeding heads and risers of all cast metals. An exothermic compound for the elimination of piping and the control of shrinkage in the feeding heads. Increases the yield, decreases porosity and shrinkage and does not contaminate the metal. There are no obnoxious fumes. There is a grade of SOFFEL'S CARBON-FREE LIQUIDIZER for every type of cast metal.

THERMO IRON CUPOLA FLUX

SOFFEL'S THERMO IRON CUPOLA FLUX has an exothermic action in the cupola which will raise the temperature of the metal. The amount of coke used per ton of iron melted can be reduced. In many instances the savings in coke alone more than pays the cost of the flux. Output is increased 15 to 25% since the metal will melt faster and will be hotter and more fluid. This greater fluidity will cause the liquid slag to rise very rapidly to the top of the metal, bringing with it sulfur, dirt, oxides, occluded gases and other impurities. Eliminate casting rejects due to gassy metal and without harm to cupola or ladle linings. It is not a soda base flux.

DENSILTITE IRON LADLE FLUX

DENSILTITE is guaranteed to clean the metal, increase the fluidity and reduce sulfur and phosphorous. Tensile strength and elongation are greatly increased. No special handling equipment is required, simply apply in the bottom of the ladle or into the stream of metal from the cupola and the exothermic action of Densiltite instantly increases the temperature about 200° F., reducing sulfur, phosphor, oxides, gas and other impurities in the metal. It is not a salt or soda base flux, and there are no obnoxious fumes or smoke to contend with. A dry slag results from its use. Does not gum up the ladle.

"Beware of Imitations"

Pittsburgh Metals Purifying Co.

Manufacturers of Quality Fluxes and Purifiers for All Metals and Alloys

1352 Marvista St. N. S. **Pittsburgh 12, Pa.**

(*Continued from page* 134)

sirable for components requiring high toughness.

The discussion period brought out the point that vanadium-treated steels do not show any coarsening.

The annual Steel Division round-table luncheon, held on the last day of the convention, was well attended. R. H. Frank, Bonney-Floyd Co., Columbus, O., presided, and co-chairmen were V. E. Zang, Unitcast Corp., Toledo, O., and F. O. Lemmon, Ohio Steel Foundry Co., Springfield, O. Following luncheon, an extended informal discussion was conducted on the subject of "Sand Testing and Its Relation to Casting Defects."

ALUMINUM AND MAGNESIUM

Casting Design Discussed

FOUR sessions, including a luncheon meeting, were sponsored by the Aluminum and Magnesium Division during the convention. First of the session featured papers by A. M. Montgomery, Aluminum Co. of America, and P. F. George, Dow Chemical Co., Midland, Mich. A. W. Stolzenburg, Aluminum Co. of America, Detroit, was chairman, and T. E. Kramer, Acme Aluminum Alloys Inc., Dayton, O., was co-chairman.

Mr. Montgomery discussed "Metallography of Aluminum Casting Alloys," pointing out that the trained metallographist may determine many factors of commercial interest through microscopic examination of suitably polished and etched specimens. Such examination may reveal the method of casting, type of alloy, type and extent of heat treatment, grain size, presence of segregation, voids or inclusions, type of surface coating, type of corrosion, solidification rate, and type of fracture in a casting failure.

Selection of representative specimens for examination is important, and it may be necessary to examine a specimen from more than one section of the casting. Knowing the approximate stresses to which the casting will be subjected in service is helpful in selecting specimens. Preliminary radiographic examination aids in the selection, and inspection with fluorescent penetrating oil is useful in revealing surface cracks. Specimens should be removed from the casting by sawing.

Mr. Montgomery stated that it is difficult to distinguish between solution heat-treated castings and those which have been similarly treated and then artificially aged. The major difference is the reduced grain contrast in the aged specimens, particles of which usually are submicroscopic in size. However, when the castings have been subjected to a stabilizing treatment or a long-time aging treatment the precipitated particles may become visible.

During the discussion period, Mr. Montgomery said that excessively high heat-treatment, resulting in incipient melting, is indicated by the presence of intergranular deposits of fine eutectic constituent particles, or of round intra-granular rosettes of eutectic. Asked if, in his work on solution alloys, he had seen any five-sided particles, he said he had not, but suggested that if they were dove gray in color they might be calcium silicide.

Mr. George, in his paper, "Metallography of Cast Magnesium Alloys," described specimen preparation, composition of etchants, the interpretation of microconstituents and microstructures in magnesium alloys, and a number of special metallographic techniques that can be used on these alloys.

The speaker emphasized the obvious fact that specimens for microscopic examination should be representative. Sections from both thick and thin sections of a casting should be taken; chilled sections are not representative of the whole casting. He suggested the use of a hack saw for removing samples, cautioning that a power band saw will produce cold working along the saw cut.

Special techniques described included estimating the amount of massive compound in magnesium castings, analyzing solid solutions, showing diffusion, distinguishing microshrinkage from fusion voids, distinguishing phases, distinguishing between alloys, determining orientation, showing results of cold work, revealing grain boundaries, producing contrast in precipitates, and determining aging temperature.

During the discussion period Mr. George was asked if it is possible to determine the difference between voids caused by gases and those from microshrinkage. He replied that magnesium is not subject to gas porosity. He also was asked if electrolytic polishing has been used to good advantage in the examination of magnesium alloys. He answered that some work has been done along that line.

A capacity audience of approximately 200 was attracted Monday to the Aluminum and Magnesium round-table luncheon at which a progress report was made by the division's research committee. R. F. Thompson, International Nickel Co., Detroit, presided at the luncheon, with Walter E. Sicha, Aluminum Co. of America, Cleveland, chairman of the technical session.

The aluminum-magnesium research committee in the fall of 1946 initiated a study of the principles of gating, conducting its investigation at Battelle Memorial Institute, Columbus, O. The progress report comprised a motion picture of the flow of water in lucite sprues and molds. Running commentary on the picture was given by Dr. L. W. Eastwood of Battelle, who, with R. E. Swift and J. H. Jackson of Battelle, directed the work there.

As pointed out by Dr. Eastwood, the requirements for a sound gating system make it necessary to consider: (1) The formation of a vortex at the top of the sprue and the entrainment of air and mold gases therein; (2) the possibility of the entrainment of air or mold gases in the flowing liquid stream where there is a change in velocity or direction; and (3) the occurrence of splashing or excessive turbulence in the gating system or in the mold cavity by which dross is formed, soluble gases absorbed, or gas bubbles entrapped in the fluid body.

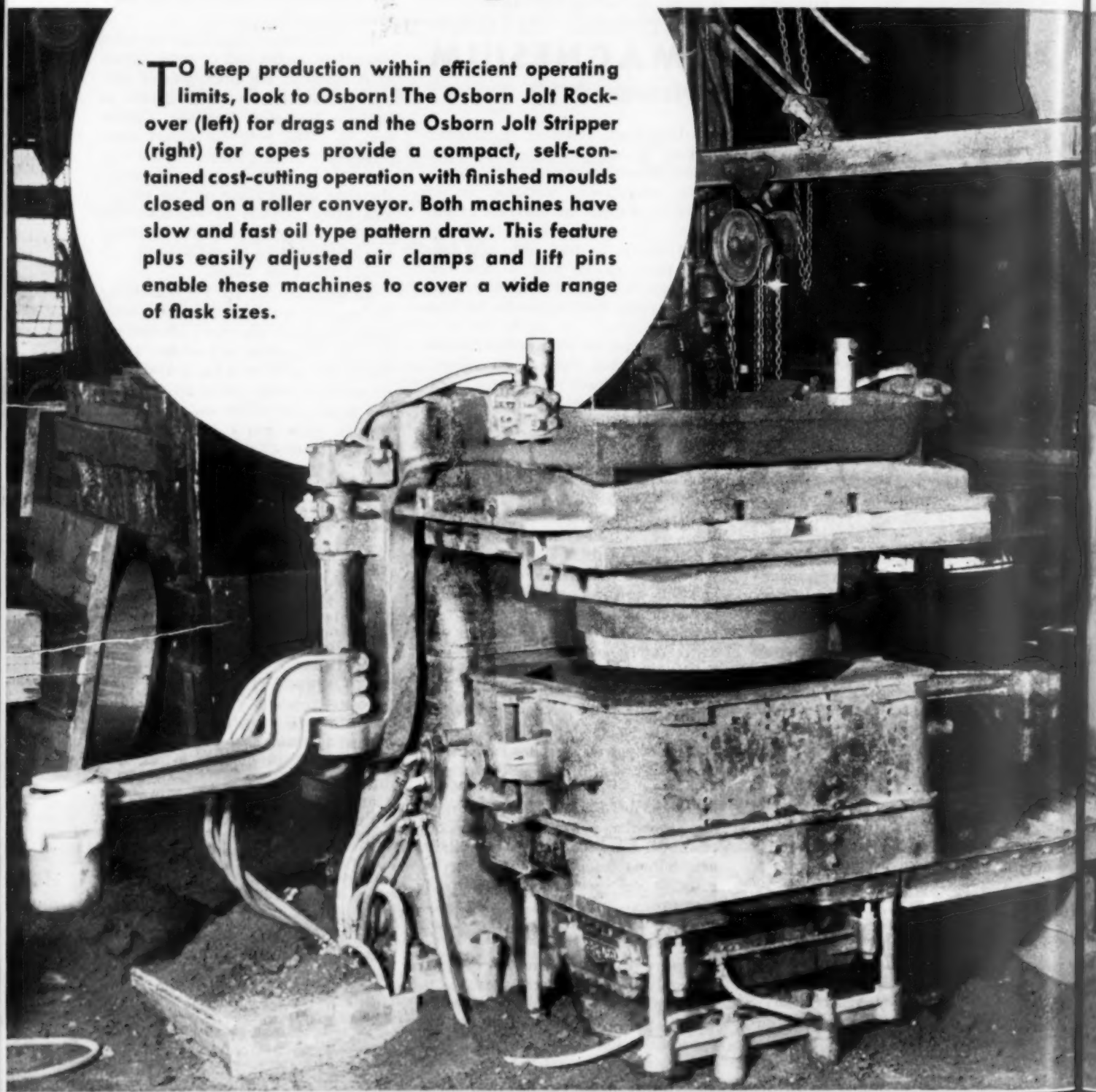
Investigate Sprue Design

In the investigation, air entrainment in the vortex at the top of the sprue or within the flowing liquid stream—resulting from change in direction or velocity, or excessive splashing—was indicated by the occurrence of air bubbles in the flowing stream. The mold employed in the study was provided permeability by small diameter perforations in the mold wall. Ten different sprue designs were employed, as well as three different pouring boxes and two different designs of molds. High-speed photography of all ten sprues showed that all of the untapered sprues, whether rectangular, round or slotted, aspirated air through vents in the sprue wall. The sprue design which corresponds to the type commonly attached to matchplates aspirated a considerable amount of air.

In general, the ideal sprue and sprue base design has a minimum taper on 6 and 10-in. lengths, with a ¾ sq in. area at the base. It was also suggested that there be a gradual increase in the cross-sectional

(*Continued on page* 140)

Low cost production with



TO keep production within efficient operating limits, look to Osborn! The Osborn Jolt Rock-over (left) for drags and the Osborn Jolt Stripper (right) for copes provide a compact, self-contained cost-cutting operation with finished moulds closed on a roller conveyor. Both machines have slow and fast oil type pattern draw. This feature plus easily adjusted air clamps and lift pins enable these machines to cover a wide range of flask sizes.

THE OSBORN MANUFACTURING COMPANY
5401 Hamilton Avenue Cleveland, Ohio

minimum floor space

OSBORN

MOULDING MACHINES

CORE BLOWING MACHINES

MEMBER

MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

(*Continued from page* 137)

area of the runner between the sprue and the first gate, while streamlining of the gates to avoid abrupt changes in direction also appears desirable. Additional recommendations were for elimination of any abrupt change in cross-sectional area of the flow stream in the gating system. Also, devices should be used to facilitate rapid filling of the pouring box.

Further work to be conducted on this project will include study of the gating systems for castings having relatively small vertical sections but substantial lateral dimensions.

The third aluminum and magnesium session dealt with design. Papers presented included "Designing Magnesium Castings for Aircraft Engineers," by M. H. Young and A. G. Slachta, Wright Aeronautical Co., Woodridge, N. J., and presented by Mr. Slachta, and "Design of Light Metal Castings," by G. H. Found, Dow Chemical Co., Midland, Mich. C. E. Nelson, Dow Chemical Co., was chairman, and W. T. Bean Jr., consultant, Detroit, was co-chairman.

In his paper Mr. Slachta stated that the goal in designing castings for aircraft engines is to reduce the weight-horsepower ratio. Progress in that direction requires close cooperation between the foundryman, metallurgist and designer. Design practice is to make a casting on the basis of the original design and then subject the casting to a series of tests. These tests indicate improvements in design, and a new casting is produced. This casting also is subjected to tests, which are of two general types—static and dynamic.

Static testing involves stress-gage and strain analyses, making use of the brittle lacquer technique and electric strain gages. Dynamic methods involve actual engine operation with electric strain gages attached. The speaker showed slides of various castings which had failed under test, and discussed the steps taken in altering the design.

In subsequent discussion Mr. Slachta mentioned that his experience did not indicate that solution heat treating of castings provided greater endurance than solution heat treating and aging. It also was pointed out that aircraft engine companies are recognizing that minor flaws in certain casting sections are unimportant. As a result, specifications have been eased somewhat with resultant reduction in scrap and cost.

In his paper on "Design of Light Metal Castings," Dr. Found stated that a major responsibility of those engaged in the engineering or supplying of aluminum or magnesium foundry products is to recognize that the principle upon which the use of light alloy castings has been established is the desire for maximum structural efficiency (maximum performance with minimum weight) at a cost lower than such performance could be obtained by other means.

Problems of designing aluminum and magnesium castings are similar. According to the speaker, developing a new design for a magnesium casting involves the following steps:

1. Theoretical determination of loads.
2. Matching those loads against known metal strength information to establish the initial design.
3. Creation of prototype casting.
4. Static and dynamic experimental stress analysis during service or simulated service loading.
5. Matching stress analysis results against known metal strength information to establish final design.
6. Creation of casting to final design.
7. Final proof testing.

In developing a light metal casting for parts previously made with other metals, the following was suggested:

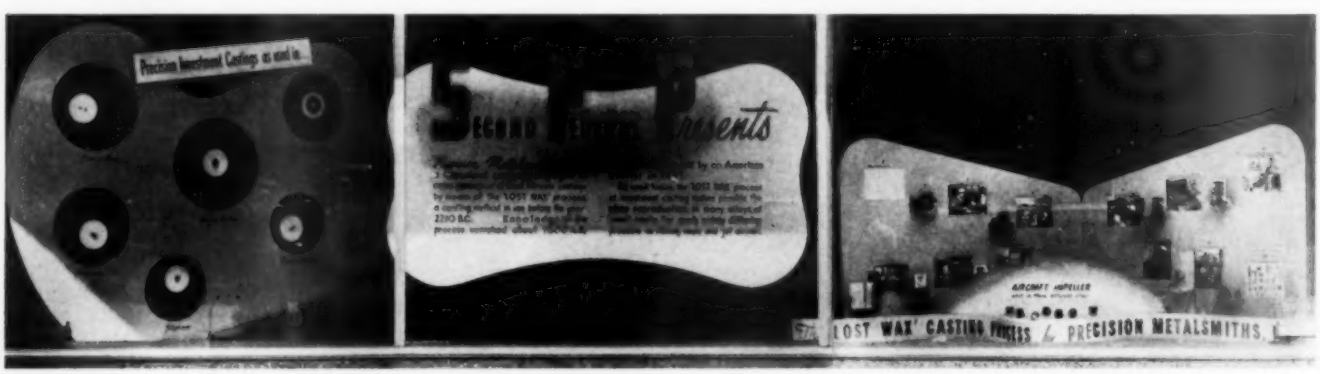
1. Assume that the former design was adequate or revise the design of parts known to have structural inadequacies or revise design features known to have been incorporated to facilitate forming of the part by fabrication methods other than casting.
2. Match sections of previous metal with proposed light metal designs, taking into account known metal strength information for both previous metal and proposed light metal to establish initial design.

Complete quantitatively useful static, fatigue, impact, and creep strength information about the metals concerned is necessary in the design operations. Dr. Found summarized the limited amount of data available for magnesium casting alloys.

In answer to the question as to the residual stress in as-cast magnesium, Dr. Found stated that it is difficult to measure, but, in his opinion, is around 2000 psi, and greater in aluminum. It also was asked whether plastic alloys will withstand greater stress than brittle alloys. Discussion brought out the fact that magnesium relaxes in the mold as it cools, with resultant lower stress. The phenomenon is related somewhat to creep. Magnesium gives just enough to compensate for load. In creep, however, the metal gives until it breaks.

At the final aluminum and magnesium session, the first of three papers, "Correlation of Cooling Curve Data

(*Continued on page* 142)



WINDOW DISPLAY: Precision Metalsmiths Inc., Cleveland, exhibited samples of its precision investment castings and portrayed steps in the process of their manufacture, during the latter part of May in the windows of Second Federal Savings and Loan Association, Cleveland. A news story in one of the local papers and participation in a radio program coincided with the display. During June the exhibit was placed in the Heights Savings and Loan Association, Cleveland, and at two branches of the Wabeek State Bank of Detroit, the last two weeks of June and first two weeks of July, respectively

to cut casting costs · · · ·

▲ *Part of our Milling Machine Section, where skilled workmen with precision machine tools handle a wide range of work.*

start with the PATTERN — (AND CORE BOXES)

IPW Service Can Save You Upwards of 20% on Overall Costs!

High precision patterns producing dimensionally accurate castings save three ways:

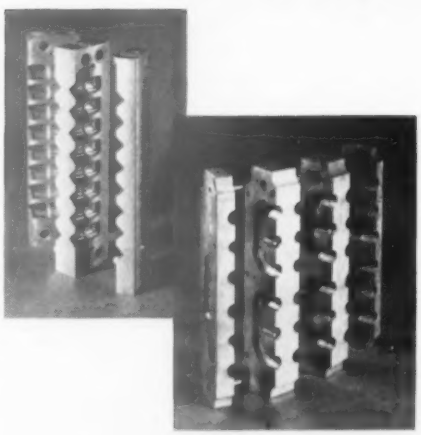
a. FOUNDRY TIME.

b. MACHINING TIME.

c. FOUNDRY AND MACHINE SHOP REJECTS.

These are tangible savings, which add up very conservatively to at least 20%. In many cases a cut of 35% has been made in overall costs, through the reductions all along the line.

It costs absolutely nothing to get full information about IPW Pattern and Core Box engineering service. Let us tell you how we can reduce your costs, improve quality and uniformity of your castings. Write us today!



Typical examples of high production multiple-row blow-boxes. Ask about our advisory service on core blowing.

INDUSTRIAL PATTERN WORKS
2600 W. BELMONT AVE. CHICAGO 18, ILLINOIS
TELEPHONE: IRving 8-0413

(*Continued from page* 140)

with Casting Characteristics of Aluminum Alloys," by E. E. Stonebrook and Walter E. Sicha, Aluminum Co. of America, Cleveland, was presented by Mr. Stonebrook. Chairman at this session was R. A. Quadt, Federated Metals Division, American Smelting & Refining Co., Perth Amboy, N. J. A. J. Juroff, Bendix Products Division, Bendix Aviation Corp., South Bend, Ind., was co-chairman.

Mr. Stonebrook described a method of translating cooling curve data into a form which indicates the approximate proportions of aluminum alloys solidifying at different temperatures, and correlated those solidification characteristics with the fluidity and hot cracking tendencies of the alloys. Fundamental study of the effect of alloy composition on solidification was supplemented by a mathematical method of analysis. Values obtained from the solidification curves and from the mathematical analyses were in generally good agreement. Good correlation also was observed between the solidification characteristics depicted by the curves and actual casting characteristics such as relative fluidity and resistance to hot cracking.

Mr. Stonebrook stated that casting characteristics of an alloy are governed generally by its composition, which controls the temperature range in which solidification occurs, and the relative amounts of metal solidifying at different temperatures. Resistance to hot cracking appeared to be proportional to the volume of eutectic formed, with maximum cracking tendencies shown by alloys forming a relatively small volume of eutectic.

It was found that relative fluidity of an alloy is closely related to the liquidus temperature and the temperatures at which successive portions of the metal solidified throughout the solidification range. Higher relative fluidity values were obtained as the difference between the pouring temperature and the weighted average of the solidification temperatures became greater.

Second paper, "Fluxing of Aluminum Alloys," was presented by Hiram Brown, Solar Aircraft Co., Des Moines, Iowa. Discussion of fluxing was divided into two classes —removal of gases and removal of solids such as aluminum oxide.

The oxide may be present in the melt in two different manners: It may be occluded in the metal and is removed by fluxing, or it may be present on the surface of the molten aluminum where it is combined to some extent with metal. In such condition it is known as wet dross and fluxing is used to convert as much aluminum as possible back into the bath, leaving the dross to float in dry form on the top.

Fluxing is done with liquid or gaseous materials which either react with aluminum oxide chemically or mechanically to cause its separation from the metal. Fluxes most generally used are chlorine or nitrogen gas, mixtures of sodium or potassium chloride and cryolite, aluminum chloride, and other volatile chlorides of metallic salts, such as zinc chloride. Mr. Brown stated that chlorine should not be used with aluminum alloys which are modified with sodium, because it will reduce the sodium content and destroy the modification effect. Mixtures containing sodium chloride and potassium chloride, or cryolite, can be used with such alloys.

Sodium-silico-fluoride is not recommended as a flux because it reacts with aluminum exothermically, tending to put some silicon into the metal by decomposition of the flux.

In discussing the removal of hydrogen from molten aluminum, Mr. Brown said that chlorine, nitrogen and borontrichloride are more effective degassing agents than salt fluxes. When it is desirable to combine grain refining with degassing, boron trichloride or some similar gas containing chlorides of titanium or boron may be used.

Discussion brought forth the comment that the use of zinc chloride as a flux is not recommended because it picks up moisture, eats gloves, clothes, etc., burns the skin and takes magnesium out of the alloy. With respect to chlorine it was suggested that neoprene rather than rubber tubing be used in its handling. When asked whether gas or plunging fluxes adversely effect pot life, Mr. Brown stated that if pots are kept coated they should not be affected.

Grain Size Important

Concluding paper, entitled "Grain Refining of Aluminum Alloys and Its Effect on Physical Properties," by Walter Bonsack and O. Tichy, Apex Smelting Co., Cleveland, was presented by Mr. Bonsack.

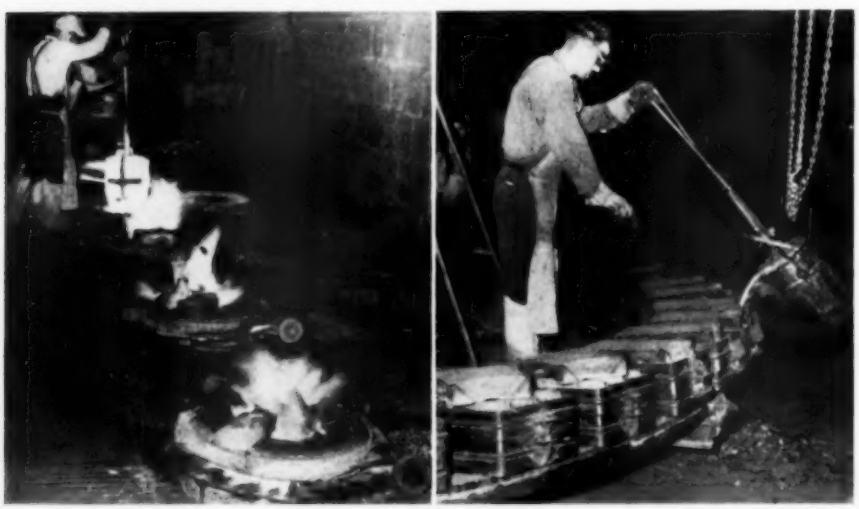
The speaker stated that grain size of an aluminum alloy determines to a large extent the mechanical properties of the alloy. Although it is often said that smaller macrograin results in higher properties, it has been found that relatively coarse-grained alloys have better properties than some fine-grained alloys of nearly identical composition.

Macrograin can be decreased in size by three ways: Increasing speed of solidification, use of grain refiners, and by working. Since aluminum casting alloys are not too well adapted to working, the current study was confined to the other two methods. Tests were conducted with Nos. 41, 53, 60 and 457 alloys. Titanium was used as the grain refining element.

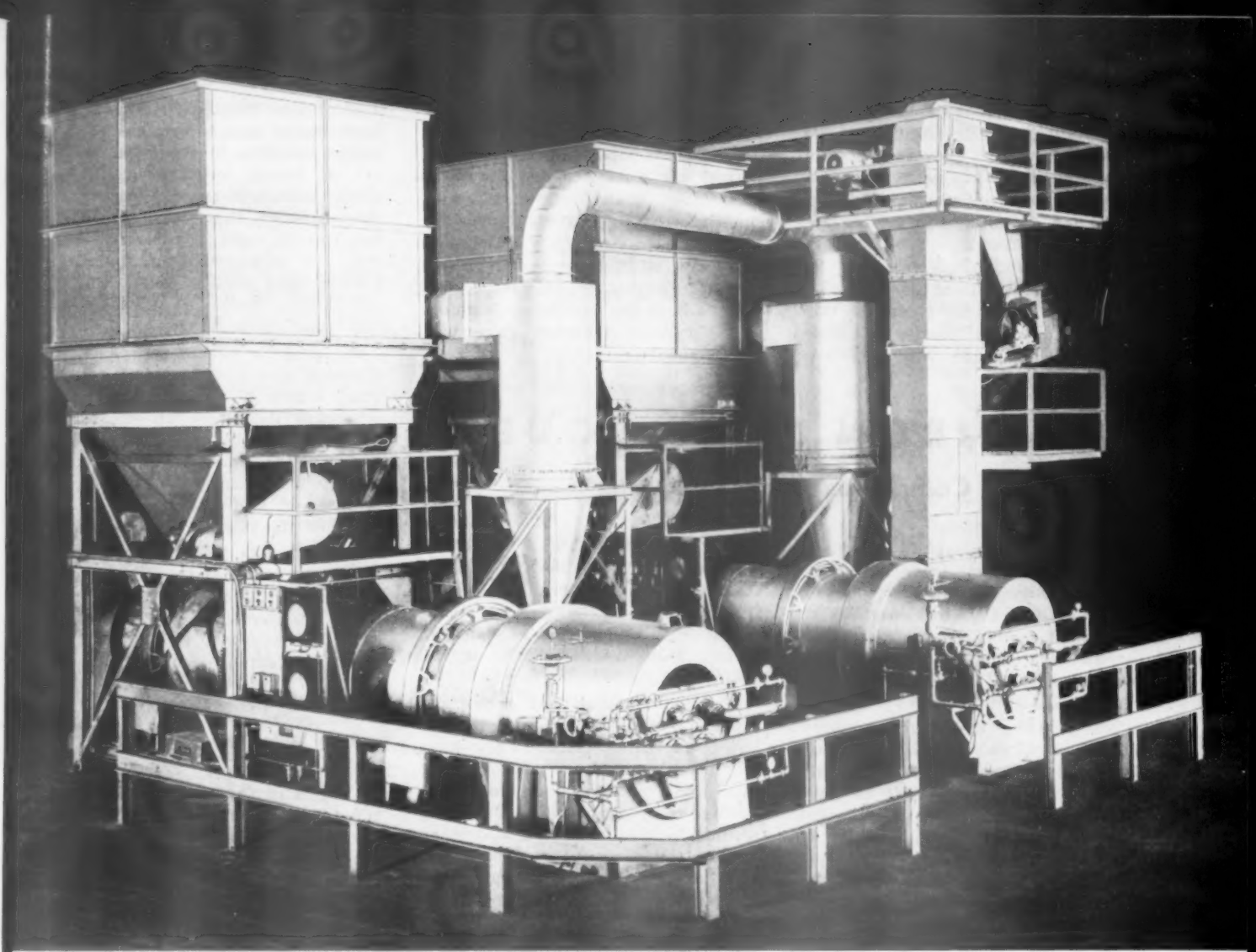
Results of the tests indicated that tensile strength and elongation are increased by reduction in grain size to optimum size, and further reduction does not increase those properties proportionally. Adding titanium to produce still finer grain has no beneficial effect and even can decrease the properties, although yield strength is the least affected of the properties tested.

It was discovered that titanium al-

(*Continued on page* 144)



OPERATIONAL VIEWS at Electric Materials Co., North East, Pa., show the withdrawing of a crucible of molten metal from an oil-fired furnace mounted in the melting department floor and the pouring of molds revolving on a turntable. Photos are by Robert Brunk, North East, Pa.



Drying Core Sand to less than ½ of 1% moisture

DRYING of core sand offers many present day advantages. It permits the use of undried sand from many different sources of supply, resulting in better deliveries, more favorable prices and lower freight rates. It eliminates all variation in the moisture content going into the mix, permitting exact control of each ingredient, and exact duplication of any mix time after time, by different operators. Core blower operations do not suffer from overwet mixes. Dried sand disperses more readily in the mix, saving on binders and core oil. Core structure benefits from a uniform bake, reducing scrap losses due to core failures.

The installation pictured above, which has been operating in a midwest foundry for about five years, consists of two complete and self contained systems installed side by side. Either unit can be operated singly by itself, or both units can be operated together, depending upon the plant requirement.

The wet sand is loaded into the storage bins with a clam. It is fed into the dryers, each 48" in dia. by 20' long with variable speed feeders. The dried sand is discharged on to a belt conveyor—is carried to the elevator—and then to the core room on a second belt conveyor. The burners are automatically controlled to save fuel, and to assure the discharge of a sand of uniform dryness regardless of variations in the rate, or moisture content of the feed. Fines are caught in a Bartlett-Snow cyclone dust collector and returned to the system again.

Economical and dependable, this installation reflects the advantage of Bartlett-Snow's intimate familiarity with the needs of practical day-to-day foundry operation. Let the Bartlett-Snow foundry experts work with you on your next sand, mold and castings handling problem. The C. O. Bartlett & Snow Co., Cleveland 5, Ohio. Engineering representatives in New York, Baltimore, Detroit and Chicago.

BARTLETT-SNOW
CLEVELAND 5, OHIO

DESIGNING AND CONTRACTING ENGINEERS

For the Foundry Industry

SAND, MOLD AND CASTINGS HANDLING EQUIPMENT

(*Continued from page* 142)
ditions apparently interfere with the orderly formation of the crystal structure. It was suggested, however, that titanium additions still offer production advantages in surface appearance, uniformity of grain size, and machinability.

Hiram Brown, Solar Aircraft Co., Des Moines, Iowa, in a written discussion, presented results of some tests he had made with titanium and beryllium as grain refiners. His results with titanium agreed with the experinece of Mr. Bonsack. Addition of about 0.1 per cent beryllium gave good grain refinement with small sacrifice of physical properties, although yield strength was the most adversely affected property. Hardness decreased with grain refinement with each of the additions. Titanium and beryllium together gave best overall results.

GRAY IRON SHOP COURSE

Comprises Three Sessions

FIRST of three evening meetings sponsored by the Gray Iron Shop Course Committee was attended by approximately 300, and was under the direction of K. H. Priestley, Vassar Electroloy Products Inc., Vassar, Mich., and N. L. Peukert, Carondelet Foundry Co., St. Louis.

W. W. Levi, Lynchburg Foundry Co., Radford, Va., discussed "Carbon Trends in Gray Iron," describing methods of carbon control in gray iron at that plant. Mr. Levi stated that to melt good iron as fast as possible for production of the best castings involves consideration of carbon content because it has more influence on finished castings than any other factor. When gray iron comes out of the cupola it is too late to change the carbon content. In discussing factors entering into carbon control he stated that the amount and type of coke and fuel used in the bed, melting rate and temperature have their effect. Moisture content of the blast has a definite effect on melting temperature.

Slides were shown of data collected over a period of years on actual operations, indicating carbon at the spout under various conditions. Types of coke used as fuel were illustrated, including pitch coke, by-product coke and beehive coke; pitch coke procured from Alabama proved best for the company's purposes. Slides were shown illustrating the use of graphite and carbon electrodes, as well as various charts showing the effect of additions of silicon and phosphorus. The effect of phosphorus is to reduce the solidification point of iron by extending the effect of silicon. Other illustrations included a chart showing the significance of adding a percentage of steel in the charge, comparing three mixtures, and a graph showing carbon absorption in cupola melting.

"Inexpensive Tests for Small Gray Iron Foundries" were discussed by W. Bohm, Buick Motor Division, General Motors Corp., Flint, Mich., at the second gray iron shop course. H. H. Wilder, Eaton Mfg. Co., Vassar, Mich., presided, with M. Reichert, Banner Iron Works, St. Louis, co-chairman.

Mr. Bohm stated that simple, inexpensive tests are as important as large, expensive tests. They have the advantage of low cost, require little time, can be performed by the average shop man, have convincing results to the average foundryman because they are in his language and he understands them, and they represent the practical approach to testing.

A series of slides were shown to illustrate a number of tests developed at Buick. One device intended to replace the spiral core mold for fluidity testing, consists of a pyrex glass tube 9 mm ID shaped like a cane. The short end is sealed with a low melting point compound and a vacuum applied to the opposite end, which also is sealed to maintain the vacuum. When the short end is inserted into a ladle of molten metal, the sealing compound melts and the metal rises in the tube to a height indicating its fluidity. However, the test as yet has not proved successful in that the stream of molten iron does not come up the tube unbroken.

Another of the slides showed chill test equipment, consisting of a block of graphite, 8 x 8 x 18 in., to which three U-shaped dry core sand molds were clamped with the open side against the block. Molten iron poured into the molds solidifies before the graphite can react with it. The graphite block is said to offer a constant surface to the metal sample and does not change characteristics like a metal chill. The equipment is light in weight, dissipates heat quickly and requires no water cooling.

In speaking of chaplets, Mr. Bohm said that they would not cause blows if they were twisted 90 degrees and then twisted back to original position before insertion in the mold. They can be tested by throwing a few in the molten riser of a casting; if they sputter they would produce blows in the mold. Chaplets used for this test measured 3 in. long and 3/32-in. thick, with a flange on each end 1/32-in. thick. The casting section was 2½-in. thick.

To test core washes and paste, the company uses a core sand slab measuring 4 x 8 in. by ⅜-in. thick with a shallow depression on one of the flat surfaces. The depression is coated with the material to be tested and the iron poured in. The reaction is observed, and when the metal has solidified the casting is inspected.

Core oils are tested by comparing results with a standard 3¼-in. cube core mixed with linseed oil and baked for a specified time. After baking, the core is sawed in half and the unbaked center scooped out and weighed. Comparisons are made with the standard core.

Metal Loss Excessive

A paper entitled "Sources of Metal Losses in the Foundry," was featured at the concluding evening session of the gray iron shop course under the chairmanship of E. J. Burke, Hanna Furnace Corp., Buffalo, with Ralph Hill, East St. Louis Castings Co., East St. Louis, Ill., as co-chairman. A discussion panel comprised of A. Barczak, Superior Foundry Co., Cleveland, N. L. Peukert, Carondelet Foundry Co., St. Louis, and William C. Wine, Sibley Machine & Foundry Corp., South Bend, Ind., discussed the problem further after the prepared review of the subject had been read by Mr. Barczak.

It was pointed out that metal losses can become of such proportions as to wipe out profits, and the subject is of prime importance not only to management but also to the plant superintendent. The following were listed as points where excessive metal losses are apt to occur and where remedial steps should be taken:

The metal yard through short weights and poor scrap; cupola—5 per cent was given as a reasonable melting loss and excessive metal splashing at the cupola spout and improper drawing off of slag were cited; poor pouring practice and excessive pigging; shakeout—it was pointed out that it pays to separate metal from shakeout sand by magnetic separators and return the metal recovered to the melting department; cleaning—through tumbling too long and failure to remove all shot from cleaned castings; poorly designed castings; bad corebox and

flask equipment; poor gating and risering; dust collector iron losses; alloy losses; and improper casting weight.

In reply to a question regarding the comparable cost of labor used to recover shot metal from sweepings and sand, and the value of the metal recovered, it was pointed out that the most satisfactory method of metal recovery is with the use of magnetic separators.

REFRACTORIES ARE DISCUSSED

By Four-man Panel

UNDER the discouraging handicap of a simultaneous session devoted to the currently intriguing subject of nodular cast iron, the AFS Refractories Committee conducted a panel discussion on refractories problems. The meeting was called to order by Committee Chairman A. S. Klopf, Western Foundry Co., Chicago, who briefly outlined the purpose and work of the committee.

R. H. Zoller, Zoller Casting Co., Bettsville, O., presided at the session, and R. P. Schauss, Illinois Clay Products Co., Chicago, was co-chairman. They served as members of the four-man panel, being assisted by R. H. Stone, Vesuvius Crucible Co., Pittsburgh, and R. A. Witschey, A. P. Green Fire Brick Co., Chicago.

First question submitted concerned the best patching material for cupolas to stand up under long heats. After defining long heats as being 8 hours or more, the panel recommended use of firestone, regular cupola blocks, clay-sand mix and clay-sand-ganister mix.

In discussion of refractories life, the theme veered around to moisture and the effect it bears on service life. C. E. Bales, Ironton Fire Brick Co., Ironton, O., expressed the opinion that too many foundries make no provision for getting the moisture out of relined ladles. It is difficult, he said, to accomplish thorough drying of tamped or rammed linings. His suggestion was that drying of ladles in core ovens is a good practice, but in addition pre-heating before filling is desirable. With molten steel, wet ladle linings will cause poor castings. The moisture may cause hydrogen penetration, and beyond this may cause a dangerous condition from steam formation.

Now that foundry operations have dropped to three or less days per week, resulting in harder service to refractories, the question was raised as to what the shop can do to minimize refractory expense. Mr Klopf ventured the opinion that most damage to a cupola lining occurs in the initial operation on a new lining, thus careful break-in will pay returns. Mr. Schauss expressed the belief that lining damage can occur at end of a run and advocated the reduction of air for a brief period before bottom is dropped.

Another question arose as to how much damage to a cupola lining is done by iron oxide; for example, rust on scrap in the charge. Pointing out that much work is being done on cupola slags, Mr. Witschey said that iron oxide is basic in character and therefore hard on refractories. Mr. Zoller added that some of the control of oxides, or basicity of the slag, can be adjusted by addition of silica sand, which is acid in nature.

SAND DIVISION COMMITTEES

Report on Various Projects

OF SIX papers presented at two sand sessions sponsored by the AFS Sand Division, three were committee reports, and one was a research project progress report. At the first session, C. B. Jenni, General Steel Castings Corp., Eddystone, Pa., presided, and T. W. Curry, Lynchburg Foundry Co., Lynchburg, Va., was co-chairman.

Leading off this session was a paper, "Plastic Binders for Foundry Sand Practice," presented by H. K. Salzberg, chemist, Chemical Division, Borden Co., Bainbridge, N. Y. It was pointed out that adhesive properties of thermosetting resins are adaptable to bonding of foundry sand cores and dry sand molds, with advantages traceable to these properties. Over the entire range of core designs rapid curing in conventional ovens is experienced, and ready response to heat at low temperatures is a characteristic of importance in drying by means of infra-red or high-frequency heat.

Mr. Salzberg said the urea resins have properties indicating their use most effectively as binder for cores for the light metals and malleable iron castings; the phenol resins of higher heat resistance are indicated for use in cores for gray iron, steel and nonferrous castings.

Green and dry core physical properties are dependent upon the resin-cereal-water relationship once the sand or sand-plus-clay ingredient is decided, and in this relationship the cereal-water ratio predominates. Surface-active chemical agents are highly effective in changing the nature of a resin-bonded sand from a sticky to a free-working condition. These are added to the sand mix during mulling.

In conclusion, Mr. Salzberg emphasized that the synthetic resins are exceptionally rapid in forming a dry skin on green sand cores, thus contributing to delayed green strength before baking. While the urea resins must be used with facilities and expedients to avoid contamination of foundry sand and atmosphere with formaldehyde and amine fumes, the phenol resins are markedly free of odor during baking and pouring.

John Fraser, Cornell University, Ithaca, N. Y., presented a progress report on the Sand Division's research project on "Elevated Temperature Properties of Steel Molding Sands."

Investigate Rat-tails

"Causes of Rat-Tail Casting Defects" was the title of the final report of the Committee on Physical Properties of Iron Foundry Molding Materials at Elevated Temperatures. This report was presented by Committee Chairman H. W. Dietert, Harry W. Dietert Co., Detroit. A progress report in 1948 described the foundry work, castings, laboratory tests and reported the correlation found between laboratory test values and the rat-tail on castings.

Majority of the sands used were those commonly termed synthetic and the question arose whether the mechanical and physical properties of hot strength and expansion would reveal the sands that would cause rat-tails obtained from production foundries. The committee therefore requested of a large number of foundries working samples of sand that produce rat-tails. Five foundries submitted sands which were used to make castings and laboratory tests.

In the final report, result of the investigations were set forth as follows:

1. When both hot compressive strength and confined expansion are high, sand properties are conducive to formation of rat-tails. The rat-tail may be alleviated by lowering either alone. In practice, it is easier to change hot compressive strength than confined expansion.

2. Best laboratory tests found to determine whether a sand would or would not produce rat-tails on castings were the hot compressive strength at 1100° F and confined expansion test at 1500° F.

3. For gray iron plate castings, similar to test castings of the investigation, a hot compressive strength at 1100° F within the range of 50 to 8 psi having confined expansion at 1500° F as low as possible, preferably below 0.030-inch per inch of length, is suggested.

4. Additions to molding sands that confer low hot compressive strength offer a means of controlling the hot strength and yield good results in reducing rat-tails when the base sand has a high hot compressive strength.

5. Controlling the mold hardness (mold strength) of a mold within a specific range is required when one specifies a range of hot compressive strength and confined expansion values.

6. Increasing the coarseness of a sand is helpful in avoiding rat-tails in that it gives greater latitude in the control of mold hardness, hot compressive strength and confined expansion.

7. Use of cushioning materials such as wood flour, cereal, bran, etc., offers a means of reducing or eliminating rat-tails.

8. Moisture content of the sand is not a direct cause of rat-tail, but it may be an indirect cause. High moisture may cause the mold hardness to rise to a point where the expansion and hot strength are materially increased, thus producing rat-tails. However, should the mold be rammed to a controlled or specified mold hardness then no increase in confined expansion or hot strength is obtained, thus no rat-tails are formed.

9. Rat-tails were most prevalent on the drag side of the test casting.

Three papers were presented to a capacity audience at the second Sand Division session, presided over by J. A. Rassenfoss, American Steel Foundries, East Chicago, Ind., and H. K. Salzberg, the Borden Co., Bainbridge, N. Y.

The first paper, "pH of Foundry Sands," by B. H. Booth, Carpenter Bros. Inc., Milwaukee, comprised an interesting study of the effect of pH value (relative acidity or alkalinity) of various foundry sands on such properties as green and dry strengths and permeability. A meter was used to measure the pH values, and adjustments in these values were made by sodium carbonate additions.

Experiments indicated that green strength of some sands rises to a relatively early peak with increasing pH value, while dry strength improves steadily with further increases in pH. Among examples cited was one sand mixture in which dry strength was increased from 67 pounds to 479 by an addition of ½ per cent sodium carbonate. In another case the addition of 12 ounces of sodium carbonate proved to be more than the equivalent, in providing dry strength in a sand mixture, of 2 gallons of pitch binder.

A progress report on "Causes of Scab Defects" was presented by G. F. Watson, American Brake Shoe Co., Mahwah, N. J., for the AFS Committee on Physical Properties of Iron Molding Materials at Elevated Temperatures. This report covered investigations of six different sands in which an angle type iron casting was poured at varying temperatures. In general, the results showed that sand mixtures most likely to show scabs in the castings are those having high dry strength, high hot strength and high green deformation.

The committee plans to continue its work, investigating other factors which influence scabbing. Additional samples of molding sand mixtures for future study are being sought by the committee and should be directed to the secretary, W. A. Spindler, Metal Processing Department, University of Michigan, Ann Arbor, Mich.

Another committee report, "A Study of the Workable Green Strength of Core Mixtures," was given by Harry W. Dietert. This comprised an investigation of four core sand mixtures—lake sand with 1 per cent oil, lake sand with ½ per cent cereal and 1 per cent oil, and oil-cereal bond in two-thirds lake sand and one-third bank sand, and a lake-bank sand composition with ½ per cent bentonite instead of cereal. Each mixture was tested for stand-up ability, roll-out ability, overhang ability and sagging resistance. Green compression and tensile strengths provided the best indications of the core to stand up, while a special machine designed to jolt the cores was employed to measure ability of the cores to roll out of the box without deformation. Resistance of overhanging portions of cores to sag also was measured by an impact machine. The last two mixtures showed up best on overhang tests, with No. 3 mixture superior in rollout properties, and No. 4 exhibiting the least sagging.

Meeting Calendar

June 30-July 1—American Foundrymen's Society, chapter chairmen's conference, Chicago

July 28-29—American Foundrymen's Society, annual directors meeting, Chicago

Sept. 12-16—Fourth National Instrument Conference and Exhibit, sponsored by Instrument Society of America, Municipal Auditorium, St. Louis

Sept. 15-17 — Steel Founders' Society of America, annual technical and operating conference, Statler Hotel, Cleveland

Oct. 3-4—Steel Founders' Society of America, fall meeting Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 7-8—New England Regional Foundry Conference, sponsored by New England Foundrymen's Association and Massachusetts Institute of Technology, MIT, Cambridge, Mass.

Oct. 10-14—American Society for Testing Materials, Pacific Coast meeting, Fairmont Hotel, San Francisco

Oct. 13-15—Foundry Equipment Manufacturers Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 13-14-15—Non-Ferrous Founders' Society, annual meeting, Cincinnati.

Oct. 17-21—American Society for Metals, metal congress and exposition, Public Auditorium, Cleveland

Oct. 21-22—Regional Foundry Conference sponsored by the Metropolitan, Philadelphia and Chesapeake AFS chapters, Stevens Institute, Hoboken, N. J.

Oct. 24-28—National Safety Council, 37th National Safety Congress and Exposition, Chicago

Oct. 27-28—Gray Iron Founders' Society, annual meeting, Edgewater Beach Hotel, Chicago

Oct. 28-29—Michigan Regional Foundry Conference sponsored by the Michigan AFS chapters, Michigan State College, East Lansing, Mich. (Tentative)

Nov. 3-5—Meehanite Metal Institute, annual meeting, Hotel Carter, Cleveland

Nov. 10-11 — National Foundry Association, annual meeting, Waldorf-Astoria Hotel, New York

Nov. 25-26 — New York Regional Conference, sponsored by New York AFS chapters, Syracuse University, Syracuse, N. Y.

1950

(Tentative Schedule)

Jan. 16-19—Plant Maintenance Show and Conference, Public Auditorium, Cleveland.

Mar. 21-22 — Steel Founders' Society of America, annual meeting, Edgewater Beach Hotel, Chicago

May 8-12—American Foundrymen's Society, annual convention and exhibition, Cleveland

Oct. 12-13—Foundry Equipment Manufacturers' Association, annual meeting, Greenbrier Hotel, White Sulphur Springs, W. Va.

Oct. 19-20—Gray Iron Founders' Society, annual meeting, Netherland Plaza Hotel, Cincinnati

Nov. 8-10—National Foundry Association, annual meeting, Edgewater Beach Hotel, Chicago

ASTM Plans Pacific Area Meeting

American Society for Testing Materials has arranged 15 technical sessions for presentation of approximately 70 technical papers at its first Pacific Area National Meeting, to be held in San Francisco, at the Hotel Fairmont, during the week beginning Oct. 10. In addition, many of the society's leading technical committees will hold sessions.

Sessions of interest to those in the foundry and allied fields include one on cast iron, one on plasticity of metals and one on fatigue of metals.

Dozier Finley, research consultant, the Paraffine Cos., Berkeley, Calif., heads the general committee on arrangements, and C. F. Ramey, Standard Oil Co. of California, San Francisco, is secretary-treasurer. Prof. R. E. Davis and Prof. J. W. Kelley, of University of California, will direct the program.

CAUSE AND PREVENTION OF GAS POROSITY IN COPPER-BASE ALLOYS

Although shrinkage porosity is an important source of difficulty in the foundry, probably a more frequent and annoying source of rejects is gas porosity. It is often impossible to distinguish between the two. Gas porosity is caused by the separation of dissolved or reaction-produced gases while the metal is cooling, particularly while it is changing from liquid to solid. Reference is not included here to effects caused by wet sand, entrapped air, and similar causes since these are mechanical effects which are not subject to metallurgical laws.

The gases that produce porosity in copper-base alloys are primarily hydrogen, water vapor, carbon monoxide, carbon dioxide, and sulfur dioxide. However, the study of gas porosity is concerned chiefly with the behavior of the elements hydrogen and carbon since the solution to the problem lies in the control or the elimination of the compound gases they form with oxygen. The behavior of each of these elements will be studied separately since hydrogen is a gas and carbon is a solid.

The laws of physical chemistry provide that hydrogen will be absorbed only if there is a vapor pressure of hydrogen in contact with the molten metal. Furthermore, the amount of hydrogen dissolved increases with increasing vapor pressures and temperatures. Water vapor must be considered together with hydrogen since it decomposes into hydrogen and oxygen at the temperatures at which copper-base alloys are melted.

The phenomena of vapor pressure can be explained in a homely way by considering why the housewife avoids hanging out the wash on a foggy, humid day when the air is very still. The reason is that the moisture in the clothes cannot evaporate readily since the atmosphere is already saturated with water vapor. On a dry, sunny day, the moisture in the clothes has little difficulty evaporating. In other words, the vapor pressure of the water vapor in the air controls the amount of moisture that will remain in the clothes. Similarly, the vapor pressure of the hydrogen in the furnace atmosphere controls the amount of hydrogen that will remain in the molten metal. The ideal condition would exist if no hydrogen were present in the furnace atmosphere. However, this condition is impossible of practical attainment since water vapor is almost always present even if at times hydrogen itself is not one of the products of combustion.

From Copper-base Casting Alloys, published by Federated Metals Division, American Smelting & Refining Co., 120 Broadway, New York 5.

In connection with the problem of gas porosity, it should be noted that the primary source of gas absorption is the condition under which the metal is melted in the foundry. Gas holes in the raw material are unimportant as is evidenced by the fact that castings rejected due to gas porosity can be remelted and will produce sound castings if the melting practice is correct.

In studying the mechanism by which hydrogen separates from the molten metal, it will be observed that solubility of hydrogen in the metal decreases as the temperature drops; it follows a pattern similar to the volume contraction that occurs with decreasing temperatures. A low volume of gas separates until the liquidus temperature is reached, and then a rapid decrease in solubility occurs leading to separation of greater volumes of gas. The abrupt change in solubility while the metal passes through the solidification range is the primary cause of gas porosity in castings.

Study of shrinkage porosity reveals how crystals form and leave cavities which must be filled by the remaining liquid metal. As each crystal forms it rejects atoms of gas which keep concentrating in the liquid portion of the metal. As solidification proceeds the liquid becomes richer and richer in hydrogen, and if no oxides are present, it will burst forth in the form of bubbles when the pressure of the hydrogen in the concentrated liquid exceeds atmospheric pressure. The reaction is similar to that which occurs when water is boiled. As heat is applied to water, a point is reached where the vapor pressure of the water exceeds atmospheric pressure, and bubbling and boiling begin.

If oxides are present in the metal they concentrate with the hydrogen in the liquid that collects between the crystals. As solidification proceeds, the metal oxides and hydrogen remain in equilibrium until the saturation point is reached. Here a compound gas—water vapor—is formed from the reaction between hydrogen and metallic oxides. This gas is the usual cause of gas porosity.

In the case of carbon, recent investigations have shown that this element is soluble in copper and copper-base alloys. Although the amount of carbon soluble in the liquid metal is probably less than 0.004 per cent, it can be a source of gas porosity. The conditions for carbon solubility are particularly favorable where melting is conducted in reducing atmospheres and at high temperatures. Such conditions very often occur in electric arc

CAUSE AND PREVENTION OF GAS POROSITY IN COPPER-BASE ALLOYS

furnaces where the temperature between the electrodes exceeds 3000° F, and the combustion atmosphere is usually very high in carbon monoxide due to the lack of oxygen in the restricted confines of the melting unit. Under ordinary circumstances any carbon dioxide formed is reduced to carbon monoxide. Under such conditions the molten metal may dissolve carbon up to its limit of solubility, especially if very close to the electrodes.

A similar reaction may take place in electric induction furnaces which have zones of exceedingly high temperatures at times. If the high temperature zone is next to the crucible wall, which usually contains carbonaceous materials, carbon solution may take place. Carbon solution may also take place in fuel-fired furnaces if carbonaceous materials are in contact with the molten metal at zones of local overheating.

When metal containing dissolved carbon is poured through the atmosphere into the mold it picks up oxygen and forms metallic oxides in the metal. Upon solidification, the oxides and the carbon concentrate in the liquid between the crystals until the saturation point is reached. The carbon and the oxygen then combine to form the gases carbon monoxide or carbon dioxide with resulting gas porosity in the metal.

The solution to the gas problem in copper-base alloys lies chiefly in controlling the oxygen content of the metal. In aluminum alloys, where oxygen has negligible solubility, gas elimination can be accomplished simply by flushing the molten metal with an inert gas just prior to pouring. Copper-base alloys require a more complicated routine, and optimum results can be obtained only by following a planned method of procedure from the beginning of the melting cycle to the casting of the metal.

It is essential to melt in an oxidizing atmosphere so that hydrogen or carbon absorption will be eliminated or at least held to a minimum. Reducing elements such as phosphorus should not be present in the metal being melted, so as not to counteract the benefits of oxidizing melting. Generally speaking, if excessive phosphorus is present in the ingot or rerun metal, it should be eliminated by the addition of copper oxide or a similar oxidizing agent to the charge. Electric arc furnaces should be provided with a suitable amount of air by mechanical means or by enlarging the opening in the pouring spout.

Tin bronzes should be superheated about 50° F to 100° F above the pouring temperature and skimmed after they have been transferred to the pouring ladle. Zinc necessary to adjust melting losses may be added at this point and may have the additional benefit of creating a flushing action which may aid in eliminating some of the dissolved hydrogen. After skimming the metal should be permitted to stand undisturbed in air as long as possible, until the required pouring temperature is reached. This allows hydrogen to escape because of a lower vapor pressure of hydrogen above the crucible. As the last operation before pouring, enough phosphor-copper should then be added so that a residual amount of about 0.02 per cent remains in the metal, the equilibrium value of the hydrogen-oxygen reaction will not be exceeded, and no steam that can cause porosity in the casting will be formed.

Yellow brass and manganese bronze are seldom subject to hydrogen gas porosity since the continual formation of zinc vapor flushes out any dissolved hydrogen while at the same time it continually dilutes the amount of hydrogen present in the furnace atmosphere. Gas porosity in these alloys generally is due to carbon absorption. Oxidizing melting will aid in overcoming this difficulty. Excessive flaring should be avoided, although a short flaring period may be of help.

Silicon bronzes and aluminum bronzes offer a different problem. Silicon and aluminum have a high affinity for oxygen and form an oxide film on the molten metal. Absorbed hydrogen will have difficulty in escaping and it is good practice to break up this film periodically while the metal is being heated. After it is transferred to a ladle the metal should be skimmed and the film should be broken again. Although the usual type of rotary stirring should be avoided, it is good practice to agitate the metal gently by inserting a bar and working it up and down in a vertical direction from the top to the bottom of the crucible. This breaks up the film and allows gas to escape.

SCOPE OF SERVICES
IN BASIC FOUNDRY ENGINEERING

Our engineering of every project is geared to the particular needs of the individual company.

Our end result is an operating plant.

The practice of voluminous reports on anticipated objectives puts an overburden in the project cost or is otherwise misspent. A simpler method screens out the errors in judgment and misapplications and saves this expense.

We combine engineering, which entails all design and detailed construction drawings, with installation supervision to insure a single responsibility for integration of the production means from raw materials received to finished product shipped.

Included is the design of processing equipment, special mechanical devices, material handling systems, sand conditioning, materials reclamation, disposal of gases and solids, etc.

Capital investment and operating costs can be reduced by our design ideas and techniques.

And the difficult assignments are very welcome.

Whether the undertaking is great or small in scope we are equally interested in discussing it with you. If you have a problem, ask us about it. No obligation attaches to any work prior to formal engagement.

FRANK D. CAMPBELL

Consulting Engineers

SERVING THE FOUNDRY INDUSTRY

332 SOUTH MICHIGAN AVE., CHICAGO 4, ILLINOIS

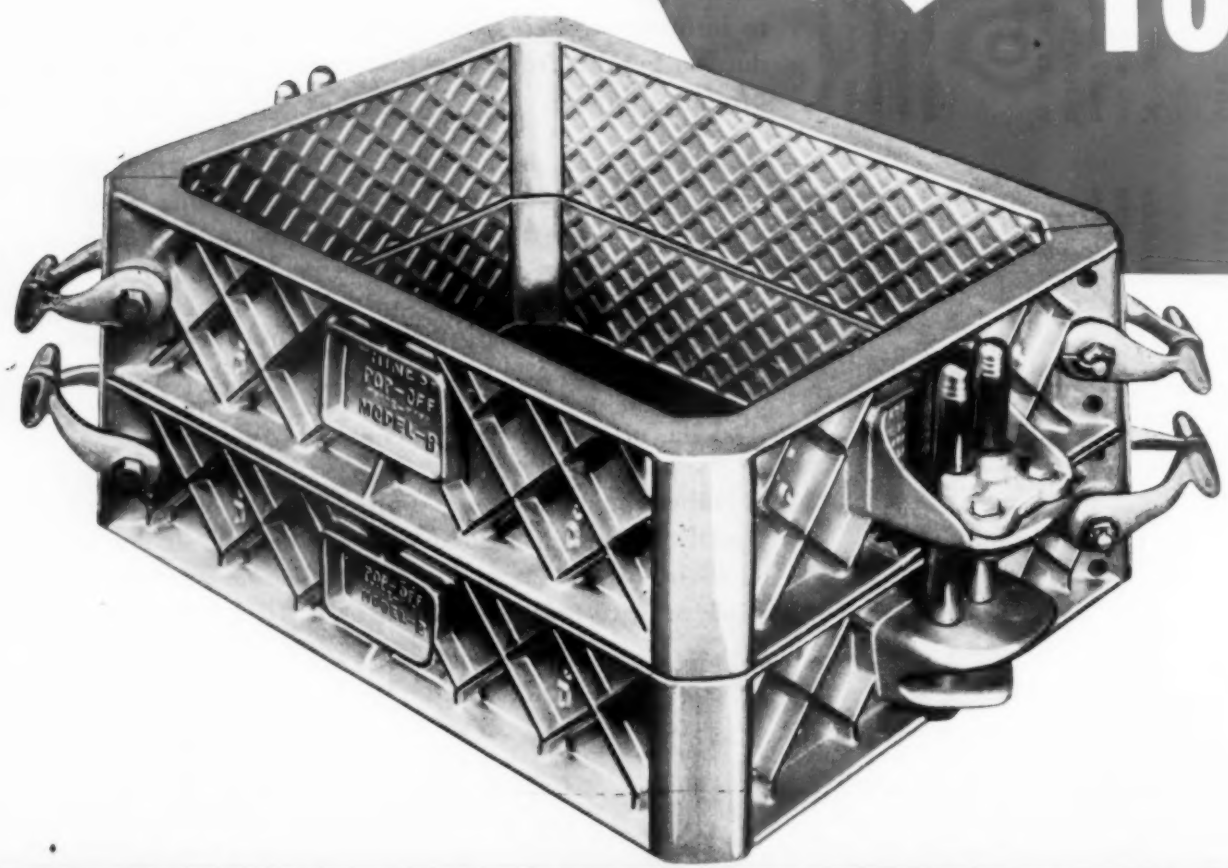
THE FOUNDRY DATA SHEET JULY 1949

GET
EVEN *MORE*
FROM
THE *BEST*

HINES
POP-OFF
(Trademark Reg. U. S. Pat. Off.)
FLASK

Right Now

Your



THE HINES

3431 WEST 140th ST.

is a Good Time to RECONDITION Flasks and Jackets

Send them in and
get an estimate for a good
factory rebuilt job.

FLASK CO.

CLEVELAND 11, OHIO

ACTIVITIES OF FOUNDRY Groups

Chesapeake

MEMBERS of the Chesapeake Chapter of the AFS heard O. J. Myers, Werner G. Smith Co., Minneapolis, speak on "Cores" at their April meeting held at the Engineers Club, Baltimore.

In his opening remarks the speaker pointed out that cores are essentially 95 per cent sand and 5 per cent binder, of which 3 per cent is water, and 2 per cent is divided between core oil and cereal. Cereal is used to give green bond to the mixture while core oil adds dry (or baked) bond.

Mr. Myers went on to say that if it would be possible to supply both green and dry bond through the addition of only one of these agents, the other would not be necessary.

The Werner G. Smith Research Laboratory is experimenting with various oils in an attempt to produce green as well as dry bond in a core sand mixture. It was discovered that a completely dry, dense (five screen) sand is necessary to produce the desired characteristics. This dense sand gives smoother castings exhibiting less penetration than the normal moisture-bearing mixture.

Mr. Myers concluded his talk by discussing advantages and disadvantages of the core binders being produced today, and he attempted to demonstrate how better binders could be produced through research.

New officers and directors elected on May 27 for the coming season are: Chairman, J. B. Mentzer, Wood Embly Brass Co., Waynesboro, Pa.; vice chairman, A. A. Hochrein, American Smelting & Refining Co., Federated Metals Division, Baltimore; secretary-treasurer, C. A. Robeck, Gibson & Kirk Co., Baltimore; and technical secretary, William H. Baer, Naval Research Laboratory, Washington.

New directors with terms expiring in 1952: Blake M. Loring, Naval Research Laboratory, Washington; T. B. Belfield, Cochrane Foundry Inc., York, Pa., and C. D. Galloway, Chambersburg Engineering Co., Chambersburg, Pa.—*Jack H. Schaum, National Bureau of Standards, and C. A. Robeck, Gibson & Kirk Co.*

New Jersey

MODERN techniques in plastic pattern making were discussed by Franz Schumacher, chief pattern maker, the Cooper Alloy Foundry Co., Hillsdale, N. J., before members of the New Jersey Foundrymen's Association, Newark, N. J., May 16.

Originator of the patented Schumacher process for mounting plastic patterns, he explained the making of plastic patterns, described the various uses to which they are applicable and gave some comparative costs of plastic versus aluminum patterns. With aid of equipment he demonstrated the process and gave out samples of baked plastic material.

Mr. Schumacher became a master pattern maker in 1923 and has specialized in plastic as well as metal and wood patterns. Under his direction, Cooper Alloy has enlarged its pattern shop six-fold within the last three years.—*Ben K. Price.*

Central Ohio

APPROXIMATELY 100 members and guests of Central Ohio Chapter of the AFS attended the May 9 meeting at Chittenden Hotel, Columbus, O., to hear Nathan Janco, president, Centrifugal Casting Machine Co., Tulsa, Okla., discuss "Centrifugal Casting." Mr. Janco gave a general description of centrifugal casting procedure as applied to gray iron, steel and nonferrous metals. Differences between true centrifugal casting and semi-centrifugal or centrifuged casting were described, and examples of castings produced by both methods were illustrated with slides.

Advantages of centrifugal casting in promoting directional solidification, reducing cold shuts, and reducing dirt defects were discussed. By intelligent application of the process which is being generally applied for casting of all metals except malleable iron and light alloys, many foun-

(*Continued on page* 154)

CHESAPEAKE Chapter of the AFS met at the Engineers Club, Baltimore, Apr. 22 to hear O. J. Myers, Werner G. Smith Co., speak on "Cores." At the meeting, left to right, were: W. C. Dodds, American Standard; Bill Mehner, Cleveland Flux Co.; Charles Schildt, Frick Co.; R. E. Martin, Pangborn Corp.; Allen Kittrell, Leach Pattern Shop; Donald Wenger, Gibson & Kirk Co.; Howard Horner, Frick Co., nominating committee chairman; Mr. Myers: Blake Lorina, Naval Research Laboratory, chapter chairman, and J. B. Mentzer, Wood-Embly Brass Co., chapter vice chairman.

Consider these savings

MOGUL® Cereal Binder puts money in your pocket in these three ways:

SAVES TIME...
dries quicker

IMPROVES QUALITY
...yields smooth cores

AVOIDS WASTE...
reduces discards

Ask, without obligation, our Technical Sales Department for full technical service in the profitable use of *MOGUL Cereal Binder.*

CORN PRODUCTS REFINING COMPANY

17 BATTERY PLACE • NEW YORK 4, N. Y.

(*Continued from page* 152)

dries have been able to increase casting yield and reduce casting rejects. For effective utilization of the process in production, it is essential that hot metal be available for practically continuous pouring during the day. Machines are adaptable and each machine can be used to produce a rather wide range of casting sizes and types with very little time required for changeover. An active discussion followed the talk.

Annual picnic of the chapter will be held in August.—*H. W. Lownie Jr., Battelle Memorial Institute*

Central New York

HIGH school vocational guidance directors in the central New York area attended a special afternoon program which was part of the Apr. 8 meeting of Central New York Chapter of the AFS held at Cornell University, Ithaca, N. Y. Nearly 50 educators were present at the afternoon meeting and most of them remained for the evening's technical session. Cornell University and the Foundry Educational Foundation cooperated with the chapter in presenting information to the group on the opportunities awaiting students in the foundry industry.

Prof. M. S. Burton of Cornell's School of Chemical and Metallurgical Engineering presided and introduced the following speakers: George K. Dreher, executive director, Foundry Educational Foundation, Cleveland, whose topic was "Training Engineers for the Foundry Industry." Mr. Dreher pointed out that careers in the foundry industry are open for the following types of engineering graduates: Mechanical, metallurgical, industrial, electrical and business and engineering administrators. Other professions that find a place in the industry but to a lesser extent are: Chemical, civil, ceramic, architectural and sanitary engineers with a few opportunities for physicists and industrial relations graduates.

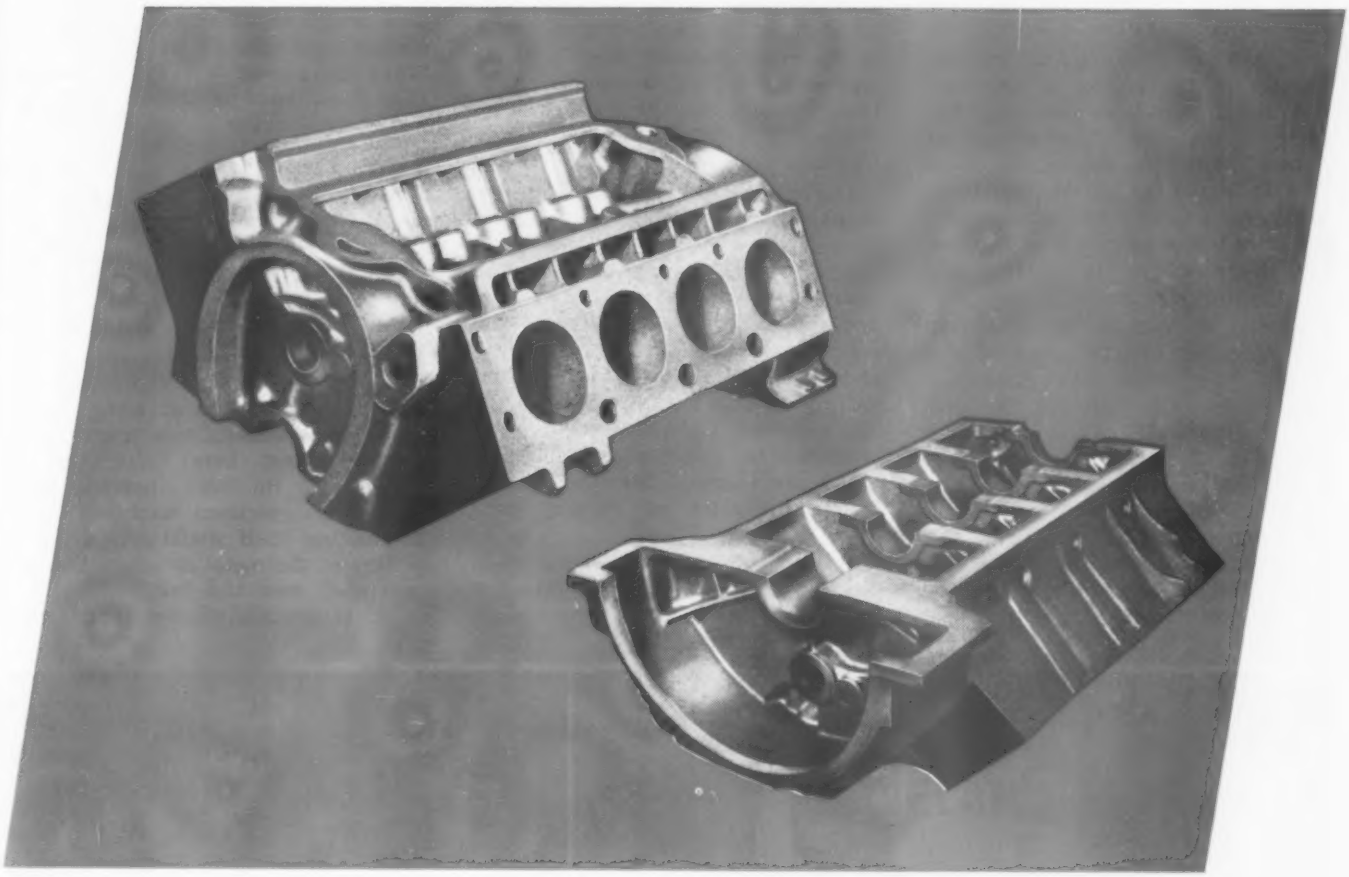
J. O. Ochsner, Crouse-Hinds Co.,

(*Continued on page* 156)

RESEARCH COMMITTEE of the Steel Castings Institute of Canada heard Franz Schumacher, chief patternmaker, Cooper Alloy Foundry Co., Hillside, N. J., speak on "Modern Techniques in Plastic Pattern Making" May 12 at the Bureau of Mines, Ottawa. Mr. Schumacher is originator of the patented Schumacher process for mounting plastic patterns. In conjunction with his talk, he demonstrated techniques involved in successful plastic patternmaking

CENTRAL OHIO Chapter of the AFS met at the Bancroft Hotel, Springfield, O., Apr. 11. Wives of some of the members were in attendance to participate in the social part of the meeting. Photos courtesy of W. W. White, Jackson Iron & Steel Co.

Another Engineering Achievement by BUFFALO PATTERN WORKS



These New Motor Blocks Are Made With High Accuracy Buffalo Pattern Works Equipment

Buffalo Pattern Works recently completed several duplicate sets of machined, high-speed production equipment to produce this late model cylinder block with a low scrap ratio and low machining cost. This brand of skill has been the hallmark of Buffalo Pattern Works for over 56 years.

We invite you to consult us regarding your production pattern requirements.

Since 1893

BUFFALO PATTERN WORKS

830 HERTEL AVE. BUFFALO, N. Y. RI. 3512

(*Continued from page* 154)

Syracuse, N. Y., addressed the group on "High School Graduates and the Foundry Industry." Mr. Ochsner described the improvement in working conditions and discussed the wages of skilled help in the foundry as compared with those of skilled help in other lines of industrial operations.

In conclusion, Dr. F. H. Rhodes, director of the School of Chemical and Metallurgical Engineering, discussed "Foundry Engineering at Cornell." After the session, the group was conducted through the metallography, sand testing and foundry laboratories where members of the faculty described the use of the various types of equipment.

Dinner at Willard Straight Hall was attended by 128 members and guests after which the group adjourned to Olin Hall for the evening's technical session. Chapter Chairman C. M. Fletcher, the Fairbanks Co., Binghamton, N. Y., thanked the university for its cooperation and the educators for their attendance. Mr. Fletcher also described the "spadework" being done on the New York State Regional Conference to be held in Syracuse on Nov. 25-26.

Harry W. Dietert, Harry W. Dietert Co., Detroit, was the meeting's principal speaker and his talk was entitled, "Relation between Casting Defects and Physical Properties of Foundry Sands." Mr. Dietert pointed out that foundry workers are a happy group because their work is interesting and not boresome. Also, that molders, by processing sand, practically create an object from nothing.

The speaker then described foundry sands as an engineering material and showed how their characteristics are controlled and changed to meet the many requirements and duties they are subject to in the molding and coremaking processes. By using slides, Mr. Dietert showed several casting defects caused by sand and the resulting improvement or elimination of the defect when sand properties are changed. Mr. Dietert also presented tables of various sand specifications.

Fred G. Sefing, International Nickel Co., New York, was the principal speaker at the May 13 dinner meeting, Onondaga Hotel, Syracuse. Approximately 70 members and guests were present.

In his presentation of the subject, "The Significance of Test Bars in Relation to Casting Properties," Mr. Sefing emphasized the fact that foundrymen know their metals better than design engineers, mechanical engineers, production men, and others. When these men ask for specifications which have no direct bearing on the particular use of the casting to be supplied, it is the foundrymen's duty to explain which specifications or tests will give a more direct indication of the properties required of the metal structure of the casting.

He covered the four ways of testing castings; namely, service tests (best but costly in time and money), accelerated service tests (save time but require correct correlation of test with service), physical tests (nondestructive testing, destructive testing and test bars) and chemical tests. He also pointed out that a test specimen machined from the casting itself would give a truer picture of the metal structure than a separately cast test bar.

(*Continued on page* 158)

SAGINAW VALLEY Chapter of the AFS met at Fisher Hotel, Frankenmuth, Mich., Apr. 7. Shown at upper left is the speakers' table. Left to right are: Lyle L. Clark, Buick Motor Division, General Motors Corp., Flint, Mich., chapter chairman-elect; Frank G. Steinebach, editor, *The Foundry*, principal speaker; Oscar E. Sundstedt, General Foundry & Mfg. Co., Flint, and present chapter chairman, and Raymond H. Klawuhn, General Foundry & Mfg. Co., Flint, re-elected secretary-treasurer. In the two lower views is a gentleman with excessive face foliage. Can you guess who he is? If not, see page 161

Pouring . . .

FASTER, EASIER WITH CLEVELAND TRAMRAIL

If you are thinking about tomorrow, you are giving serious thought to various ways of improving your foundry efficiency, speeding production and cutting costs. You will find Cleveland Tramrail of profound interest because, for the cost involved, there perhaps is no other important foundry equipment that will yield as profitable returns.

Pouring is just one example. Metal is tapped into a ladle on a tramrail carrier at the cupola. The ladle is then taken directly to the mold and poured. No rehandling. No spillage. No hard work. The crane or carrier rides freely and easily on the smooth overhead track.

Cleveland Tramrail equipment permits taking the ladle over the shortest route from cupola to mold without hindrance from floor obstacles. The metal is delivered with minimum heat loss.

Likewise in the handling of cores, sand, molds and castings are important economies and advantages possible with Cleveland Tramrail. Hundreds of installations in small and large foundries attest to the soundness of the overhead method of materials handling.

Our sales engineers will be glad to survey your needs. Their ideas may spell the difference between profit and loss in the coming period.

GET THIS BOOK!

BOOKLET No. 2008. Packed with valuable information. Profusely illustrated. Write for free copy.

CLEVELAND TRAMRAIL DIVISION
THE CLEVELAND CRANE & ENGINEERING CO.
3824 East 286th St. Wickliffe, Ohio.

CLEVELAND TRAMRAIL
OVERHEAD MATERIALS HANDLING EQUIPMENT

(*Continued from page* 156)

In closing, Mr. Sefing showed slide pictures of various types of castings giving the design properties required and specifications which would be a guarantee that these properties were present in the casting.—*J. A. Feola, Crouse-Hinds Co.*

EASTERN NEW YORK Chapter of the AFS at a recent meeting heard Day Cutler, J. S. McCormick Co., Pittsburgh, speak on "Cupolas and Their Operation"

Twin City

AT THE concluding meeting of the season held May 23 at the Covered Wagon, Minneapolis, Twin City Chapter of the AFS elected the following officers and directors: Chairman, Franklin A. Austin, Crown Iron Works, Minneapolis; vice chairman, S. L. Cameron Jr., Valley Iron Works, St. Paul, and secretary-treasurer, Lillian K. Polzin, Manufacturers' Secretariat, Minneapolis Chamber of Commerce.

Directors for three years are: H. H. Blosjo, Minneapolis Electric Steel Castings Co., Minneapolis; Harry Blumenthal, R. Lavin & Sons, Minneapolis, and John Roth, Prospect Pattern & Foundry Co., St. Paul.

Principal speaker at the meeting was Glenn W. Merrefield, foundry engineer, Giffels & Vallet Inc., Detroit, who spoke on "'Mechanization for Small Foundries." He explained how the average of 78 man hours per ton of gray iron and 100 man hours per ton of steel were obtained through foundry mechanization. Not only has there been much less actual manual labor expended during the last decade but more than 30 per cent savings in casting cost has been made possible through foundry mechanization.

Mr. Merrefield stated that in most small foundries, labor constitutes more than 40 per cent of the total cost of producing castings. Since these shops usually have no plant engineers, it is nearly always worthwhile for management to get together with an industrial engineering concern with the view in mind of drawing a master plan for future expansion and mechanization. — *O. J. Myers, Werner G. Smith Co.*

TWIN CITY Chapter of the AFS heard V. J. Sedlon, president, Master Pattern Co., Cleveland, (left) discuss patternmaking at its Apr. 7 meeting

Tennessee

FOUNDRY Sands" was the subject of an address given by C. A. Sanders, vice president, American Colloid Co., Chicago, at the Apr. 15 meeting of Tennessee Chapter of the AFS, held at Hotel Patten, Chattanooga, Tenn.

Mr. Sanders stated that economy in the foundry begins in the sand pile. Customers, more critical of castings than formerly, are rejecting castings with hair lines, whereas they formerly accepted them without question. Sand control is considered most important and sands are now being blended satisfactorily to save bentonite and produce better castings.

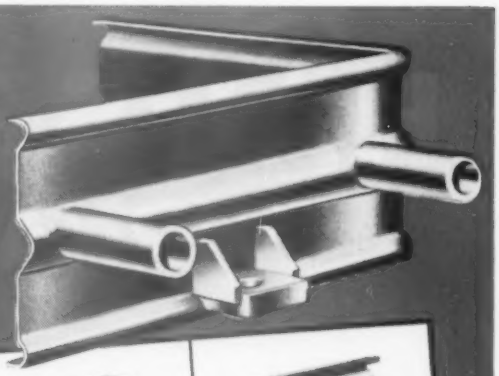
Southern bentonite is producing better results as a result of a wider understanding of its use and, because of its flowability, reduces cracks in castings. The speaker illustrated his talk with tubes of sand mounted on a charted board, as well as slides. A question-and-answer period concluded the program.—*Carl A. Fischer Jr., Fischer Supply Co.*

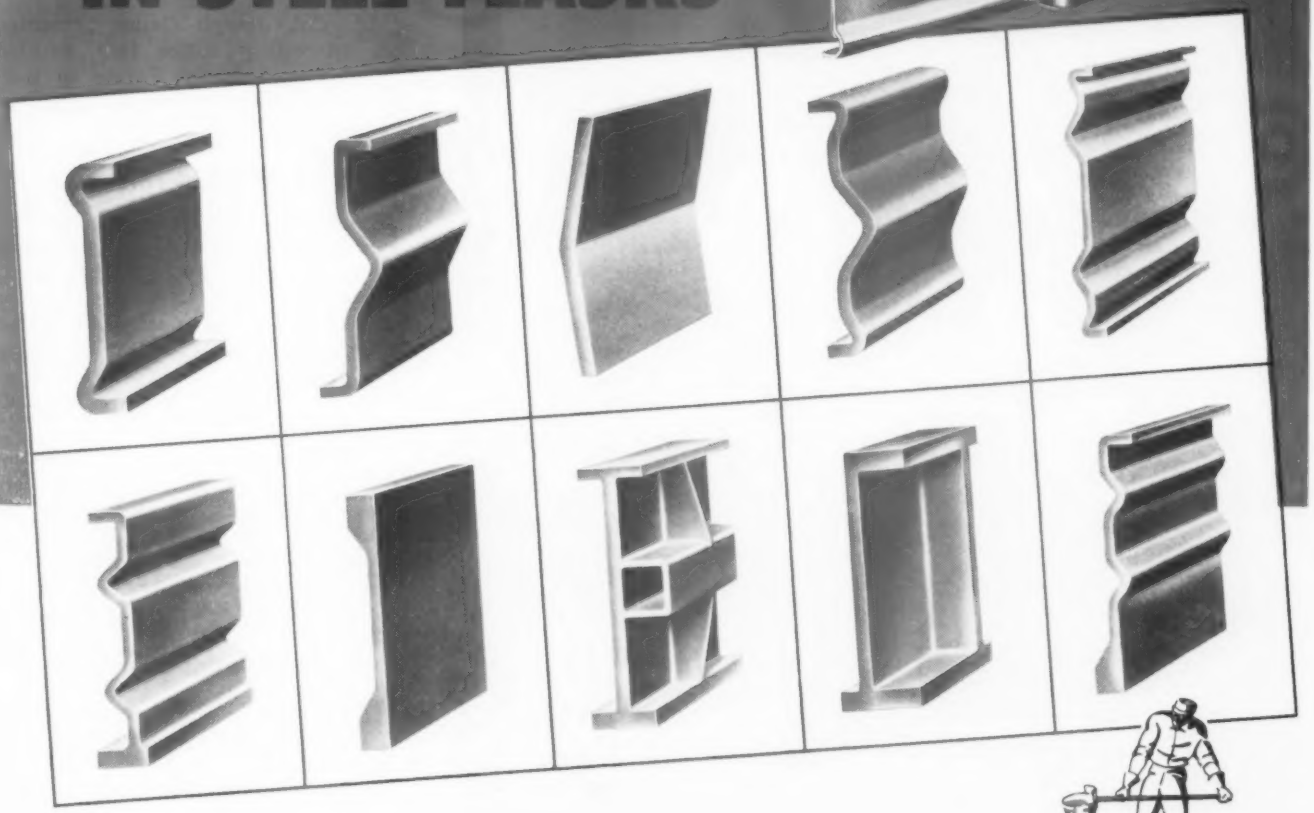
Northwestern Pennsylvania

MECHANIZED cleaning of castings was the topic discussed at the May 23 meeting of Northwestern Pennsylvania Chapter of the AFS held at the Moose Club, Erie, Pa. A. L. Gardner, advertising manager of Pangborn Corp., Hagerstown, Md., was the principal speaker. He reviewed briefly methods of cleaning castings from the 18th century up to the present time and stated that

(*Continued on page* 160)

Everything IN STEEL FLASKS





Shanafelt Flasks are built to fit your casting job and your flask handling conditions. Construction is not limited to any one particular formation — sidewalls, reinforcements, and sandstrips are designed to fit your own requirements.

The illustrations above show the versatility of the special Shanafelt formation — also different styles of sidewall and sandstrip construction which were engineered here to meet special conditions of molding and handling.

The new Shanafelt factory building was planned for making Flasks. All departments are arranged and equipped for most efficient production of steel Flasks in any size, shape and style.

Just tell us your Flask requirements and we'll promptly offer estimates on the correct Flask for your job.

The SHANAFELT Manufacturing Co.

Established 1893

2600-2700 WINFIELD WAY N. E. . . . CANTON, OHIO

SEALTYTE Chaplets and hardened steel Flask Pins and Bushings . . . shipped promptly from large stocks

HAUSFELD
FURNACES

FOR "ALL-OUT" PRODUCTION
IN NON-FERROUS FOUNDRIES

Provide the
Utmost in Speed
Production
and Safety

FURNACES FOR
BRASS • ALUMINUM • MAGNESIUM
AND ALL OTHER
NON-FERROUS ALLOYS

The Campbell-Hausfeld Co.
300-320 MOORE ST. HARRISON, OHIO

(*Continued from page* 158)

the theory remains the same but more efficient and cheaper methods have been developed. Mr. Gardner emphasized the need for proper equipment for the cleaning operation, and maintenance of that equipment.

Films on the cleaning process employed at the Ford plant were shown and John Clarke, General Electric Co., Erie, led the discussion which followed.

Lt. Col. Joseph Gauss presented an interesting coffee talk entitled "With the Armored Forces in Germany."—*James J. Farina, American Sterilizer Co.*

Boston Non-Ferrous

BOSTON Chapter of the Non-Ferrous Foundrymen's Association met May 19 at the Engineers' Club, Boston, to hear R. A. Quadt, director of aluminum developments, Federated Metals Division, American Smelting & Refining Co., New York, speak on "Typical Foundry Problems in Casting Aluminum."

In his talk Mr. Quadt discussed remedies for typical problems encountered in casting aluminum. He also displayed a collection of slides which illustrated many of the defective castings continually being studied by Federated's research department.

Washington

TACOMA members of the Washington Chapter of the AFS were host to the group for the May 20 meeting at Hotel Winthrop, Tacoma, Wash. In a short talk following the dinner Michael Bock II, Exomet Inc., Conneaut, O., pointed out that it is a good thing for foundrymen to gather together to help each other and promote the use of castings.

Stanley Marshall, metallurgist, Atlas Foundry & Machine Co., Tacoma, was principal speaker of the evening, discussing "Synthetic Sands." Mr. Marshall stated that the main factors to consider in choosing a sand are grain size and distribution. He advised selecting a sand which is retained on three to five screens, but he cautioned that too wide grain distribution and too many fines cause permeability to be too low and also produce a sand that will not yield to casting contraction.

In selecting a clay bond, consideration must be given the properties desired in the final mix, using southern bentonite for best collapsibility, western bentonite for high hot strength, and fireclay for medium hot strength. Methods of mixing influence the amount of clay required, shovel mixing requiring the most and

intensive or muller mixing the least.

When considering green strength, he said that fireclay requires longest mixing, while western bentonite develops lumps with too long mixing. Southern bentonite gives freedom from lumping. Maximum green strength will be developed with moisture on the low side. Other factors influencing green strength are ramming and amount of fines, increased ramming raising green strength. Small amounts of fines give increased green strength but larger amounts of fines require more water and the green strength is decreased.

Mr. Marshall went on to say that dry strength will be raised by increased mixing, by increased dry mixing, by increased water content, by harder ramming, by auxiliary binders (cereal, resin, or pitch) by mold sprays, and by choice of clays.

Hot strength is increased by better mixing, increased water content, and increased fines. Clay has the most influence, a bond consisting of 75 per cent fireclay and 25 per cent western bentonite producing the highest hot strength. Increased ramming increases hot strength up to 1500° F.

Permeability is decreased by harder ramming, by increased water and by improper grain distribution. Southern bentonite increases permeability.

Mr. Marshall concluded by saying that flowability is influenced by water content, type of clay, amount of fines and cereal binders. Flowability will be best at the correct temper. A decrease of moisture will improve flowability as will a decrease in clay. Increased fines reduce flowability as does cereal binder. Southern bentonite clay makes for the best flowability.

Officers elected at this meeting for the coming year are: President, E. D. Boyle, Puget Sound Naval Shipyard, Bremerton, Wash.; vice president, J. Dolansky, Griffin Wheel Co.,

(*Continued on page* 164)

DON'T LAUGH, BROTHER!

I'm an active booster of the
BEARD DERBY
being staged as a feature of the
Cork Pine City
Centennial Celebration
VASSAR, MICHIGAN
July 28, 29, 30, 31, 1949
COME ON AND JOIN THE FUN

WHISKERS: Reproduced above is the back of the whiskered gentleman's business card (see page 156). He is Kenneth H. Priestley, president and chief metallurgist, Vassar Electroloy Products Inc., Vassar, Mich., and also mayor of Vassar

"WAITERS"
...cost more than
"Tip-Money"
in your plant!

MANUAL handling on production, assembly, or packaging lines is costly in manpower two ways—time waiting for material and time required to deliver it.

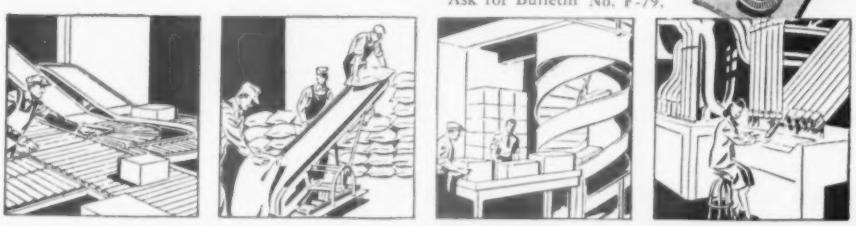
Whatever you make, package, or handle — in large or small quantities — loose or in containers — see Standard for a complete engineered gravity or power conveyor system—a portable conveyor unit — a portable, lightweight conveyor section.

The range and versatility of Standard Conveyor equipment has been developed in more than 40 years of service to business and industry.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul 9, Minnesota
Sales and Service in Principal Cities

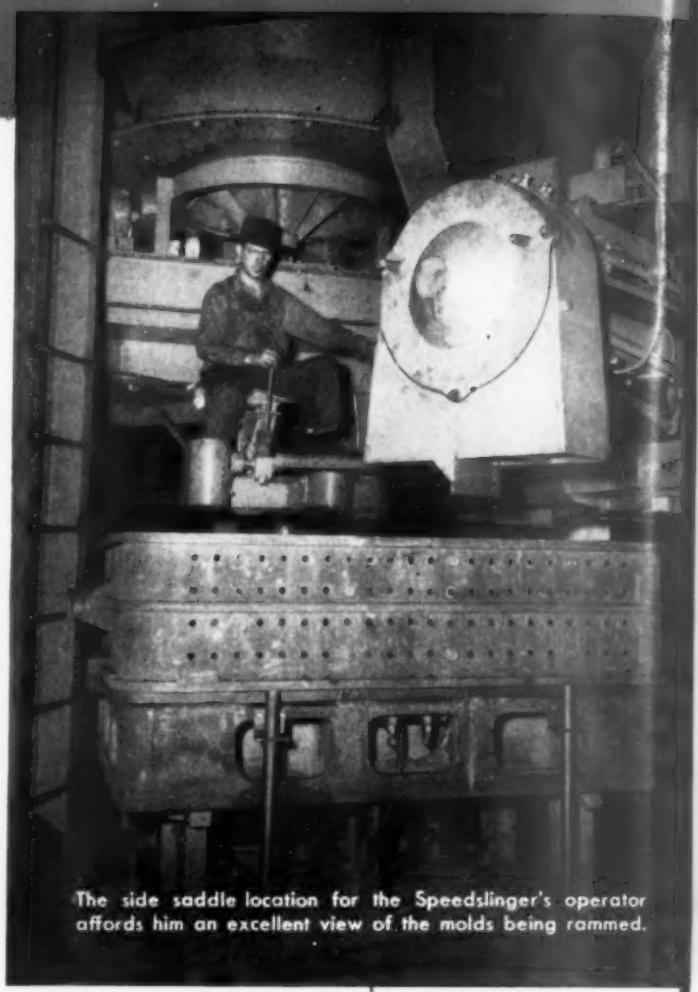
Standard
GRAVITY & POWER
CONVEYORS

Send for Standard's General Catalog—see how conveyors are used to best advantage in every field of industry. Ask for Bulletin No. F-79.



ROLLER - BELT - SLAT - CHAIN CONVEYORS • PORTABLE CONVEYORS AND PILERS • SPIRAL CHUTES • PNEUMATIC TUBE SYSTEMS

SPEEDSLINGER and SPEEDMULLORS



The side saddle location for the Speedslinger's operator affords him an excellent view of the molds being rammed.

speed production at LYNCHBURG FO

After a complete survey of all possible molding methods Lynchburg Foundry chose Speedslinger, B&P Turntable and Speed-Draw Machines to meet their molding requirements for production of castings weighing from 50 to 650 lbs. Results were gratifying, sixty tons of castings poured per day.

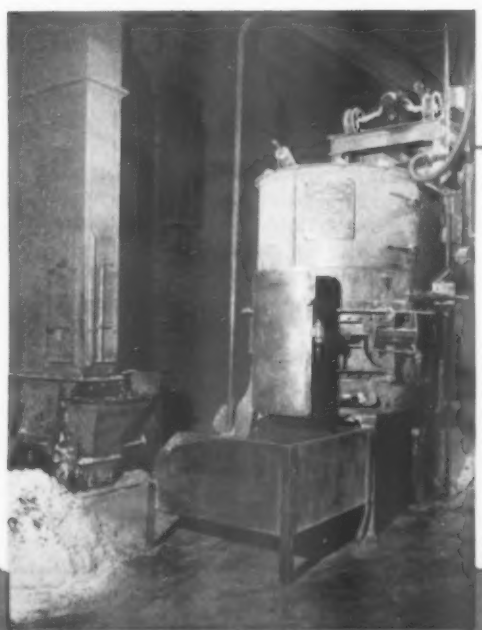
Lynchburg needed 2500 tons of completely mulled molding sand per day to supply their Speedslinger unit and another mechanized unit. This requirement was fully met by four Speedmullors, two Model "70" 's and two Model "80" 's. Another Speedmullor, a Model "40", mulls all of Lynchburg's core sand.

The Speedslinger Turntable unit with eight B&P Champion Speed-draw machines on which the molds are rammed and drawn from the patterns.

These two automatically controlled Model "80" Speedmullors insure an adequate supply of completely mulled, chemically treated, molding sand to the Speedslinger.

These two Model "70" Speedmullors supply fully mulled and cooled sand to another Lynchburg mechanized unit.

G FOUNDRY CO. LYNCHBURG, VIRGINIA



This Model "40" with skiphoist mulls all of Lynchburg's core sand.

Write for complete information on Sandslingers, Speedslingers and Speedmullors!

BEARDSLEY & PIPER

Division of

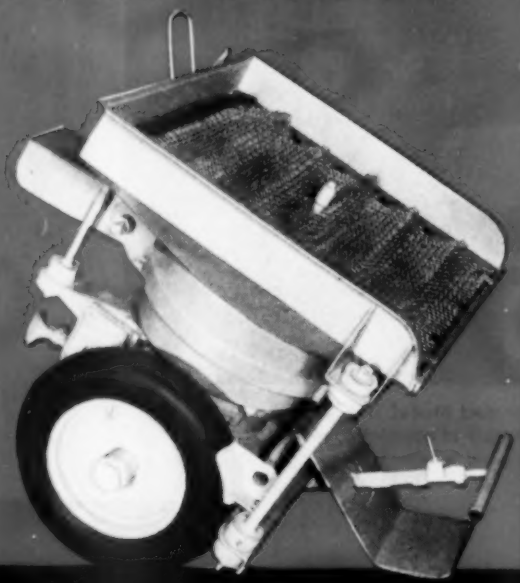
PETTIBONE MULLIKEN CORPORATION

2424 NORTH CICERO AVENUE, CHICAGO 39, ILLINOIS

Beardsley & Piper are manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmullor • Mulbaro • Screenarator Nite-Gang • Junior Nite-Gang • Preparator • Champion Speed-Draw • Plate Feeders • Turntables • Gyratory Screens

...another Better Method by

BEARDSLEY & PIPER



for lowest cost sand conditioning

SCREENARATOR

Condition your sand the most economical way! The Screenarator does a *thorough* job at low cost. It screens and aerates the sand . . . frees it from core butts, gaggers and other foreign matter . . . aerates the sand for the second time as it throws and piles the sand wherever desired. The Screenarator is electrically operated, easily moved from heap to heap. Three sizes to meet your specific needs. Get complete information on Screenarators now!

send coupon for catalog!

Beardsley & Piper are manufacturers of the Sandslinger · Speedslinger · Hydra-Slinger · Speedmuller · Mulbaro · Screenarator · Nite-Gang · Junior Nite-Gang · Preparator · Champion Speed-Draw · Plate Feeders · Turn-tables · Gyratory Screens

BEARDSLEY & PIPER
Division of Pettibone Mulliken Corp.
General offices: 2424 North Cicero Ave., Chicago 39, Illinois
Plant: 2541 North Keeler Ave., Chicago 39, Illinois

☐ Send Screenarator Catalog
☐ Have B&P representative call

FOUNDRY
ATTENTION
TITLE
ADDRESS
CITY STATE

(*Continued from page* 161)

Tacoma, Wash.; secretary, Fred Young, E. A. Wilcox Co., Seattle, and treasurer Robert Thompkins, Western Foundry Sand Co., Seattle.—*Harold R. Wolfer, Puget Sound Naval Shipyard.*

Chicago

AT ITS final meeting for the current season on May 18 at the Chicago Bar Association, Chicago Chapter of the AFS elected and installed new officers and directors for 1949-50 and held three roundtable technical sessions.

The new officers are: Chairman, W. D. McMillan, International Harvester Co., Chicago; vice president, A. W. Gregg, Whiting Corp., Harvey, Ill., and secretary, George J. Biddle, Illinois Clay Products Co., Chicago. The office of treasurer is appointive by the board of directors, and Mr. Biddle was named to fill this position also.

New directors are: Adrian C. Den Breejen, Nichol-Straight Foundry Co., Chicago; Harry J. Jacobson, Industrial Pattern Works, Chicago; Walter W. Moore, Burnside Steel Foundry Co., Chicago, and Retiring Chairman Chester K. Faunt, Christensen & Olsen Foundry Co., Chicago.

One of the roundtable sessions was sponsored jointly by the steel and pattern groups. L. D. Pridmore, vice president, International Molding Machine Co., LaGrange Park, Ill., discussed "Core Blowing." Walter Balton, assistant foundry superintendent, Link-Belt Co., Chicago, was technical chairman. Second roundtable dealt with "Industrial Hygiene in the Foundry" and was conducted jointly by the gray iron and malleable groups. W. T. Walworth, director of industrial hygiene and sanitation, Lumbermen's Mutual Insurance Co., Chicago, was speaker, and A. F. Grankowski, Hansell-Elcock Co., Chicago, presided.

J. J. Schmidt, sales engineer, Lindberg Engineering Co., Chicago, spoke on "Low-Frequency Induction Nonferrous Melting" at the nonferrous roundtable, with M. G. Dietl, nonferrous metallurgist, Crane Co., Chicago, as technical chairman.

Mr. Pridmore stated that one of the requisites in core blowing is an acceptable sand and a proper mix; one mix is not suitable for all cores. He also stated that there is no definite answer as to whether one should use high pressure and a small blow hole or low pressure and a large blow hole. Again it is a matter of sand mix. Generally, however, it is best to use as large a hole as possible in the corebox. He also com-

mented that there is no such thing as having too many vents.

How to make the foundry more healthful was the subject of Mr. Walworth's discussion which covered the potentially hazardous operations and different dangers inherent in working with certain types of cast metals. He said that, in general, the foundry industry has done a fairly good job of bettering its health conditions; however, the death rate from respiratory diseases is relatively high, which he attributed to smoke and temperature differences. The incidence of tuberculosis, while an important problem, is very little different in foundries than in industry as a whole.

Mr. Walworth, while presenting the major hazards occurring in the casting of several types of metals, explained how proper precautionary steps eliminate many of these hazards. Exhaust ventilation, use of wetting agents to lay dust and proper protective equipment were discussed.

Mr. Schmidt's discussion of low-frequency induction melting of nonferrous metals centered around the equipment used. Illustrating his talk with blackboard diagrams, he compared the various furnaces, their operating principles, advantages and limitations.—*Erle F. Ross and Howard C. Tuttle.*

Texas

TEXAS Chapter of the AFS met Apr. 15 at Hotel Angelina, Lufkin, Tex., after a day spent visiting Lufkin Foundry & Machine Co. and Texas Foundries Inc., to hear Ralph L. Lee, public relations repartment, General Motors Corp., Detroit, speak on "Qualifications of a Leader." Dr. Lee's command of the language and ability as a speaker made the talk unique, fascinating, forceful, insulting, comical, serious and hilarious all at once.

The day concluded with a dinner at the Hotel Angelina, at which Tom Shartle, president, Steel Founders Society of America, delivered a short address, and Col. Cal C. Chambers, president, Texas Foundries Inc., presided.

At the chapter's annual business meeting May 20 at Texas State Hotel, Houston, Tex., the following new officers and directors were elected: Chairman, C. R. McGrail, Texaloy Foundry Co., San Antonio, Tex.; vice chairman, W. H. Lyne, Hughes Tool Co., Houston; P. B. Croom, Houston Pattern Works, and E. W. Wey, Dee Brass Foundry, were re-elected as secretary and treasurer, respectively. Jake Dee,

New the NITE-GANG
for complete sand conditioning

only the NITE-GANG offers these
10 IMPORTANT FEATURES
• Self Propels!
• Self Loads—Without Prior Windrowing!
• Blends!
• Magnetically Separates!
• Breaks Lumps and Screens!
• Double Aerates!
• Windrows or Piles!
• Travels and Loads at Variable Speeds!
• Leaves a Clean Level Floor!
• Extremely Maneuverable!

As the Nite-Gang moves into the unprepared sand heap the rotating spiral completely blends and conveys all of the sand in its path to the bucket elevator. The buckets elevate and direct the sand onto the magnetic separator which removes all of the iron scrap and shot before the sand is discharged into the M5 Screenarator Unit. The Screenarator, mounted on a swivel base, screens, double aerates and windrows or piles the completely conditioned sand anywhere within an arc of 240 degrees and within a radius of forty feet.

Write for new Nite-Gang Catalog!

BEARDSLEY & PIPER
DIVISION OF PETTIBONE MULLIKEN CORPORATION
2424 North Cicero Avenue • Chicago 39, Illinois

Beardsley & Piper are manufacturers of the Sandslinger • Speedslinger • Hydra-Slinger • Speedmuller • Mullbarc • Screenarator • Nite-Gang • Junior Nite-Gang • Preparator • Champion Speed-Draw • Plate Feeders • Turntables • Gyratory Screens

1948-49 chairman, is director ex-officio.

Directors are: C. E. Silver, Texas Electric Steel Castings Co., Houston; Henry W. Creeger Jr., Electro Refractories & Alloys Corp., Houston; Gerald E. Smith, East Texas Electric Steel Castings Co., Longview, Tex., and Charles Sibbett, Refinery Casting Co., Dallas, Tex.

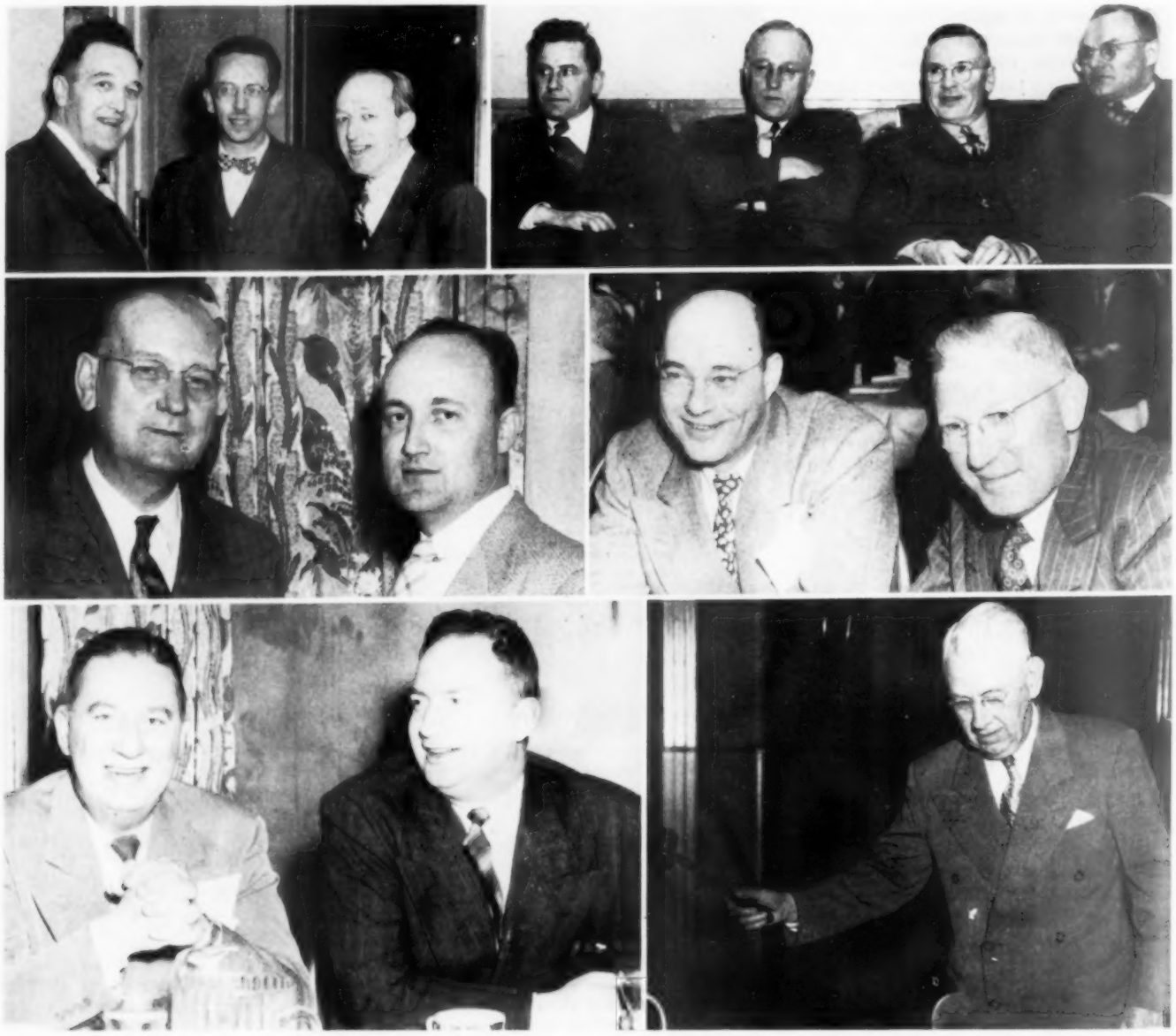
Charles F. Lewis, metallurgical engineer, Cook Heat Treating Co., Houston, spoke to the group on the value of technical societies to the individual and of the value of the AFS in particular.—*W. H. Lyne, Hughes Tool Co.*

Wisconsin

WISCONSIN Chapter of the AFS held its annual dinner for old timers and apprentices, May 13, at Hotel Schroeder, Milwaukee, with 370 members and guests in attendance. Eleven men who have been active in foundry work for 50 years or more, were given plaques, and 12 apprentice contest winners were awarded prizes. Among the old timers who have been active in foundry work for more than half a century were John A. Leisk, still active as a foundryman following 60 years of service, and John A. Devitt, with 58 years in the industry. Julius Roller, now 84 and retired, when given his plaque stated he had entered the industry at the age of 13.

In addressing the group, Robert Woodward, Bucyrus-Erie Co., South Milwaukee, and recently re-elected president of the chapter, mentioned important changes in foundry practice and equipment which have occurred the last 50 years, and stated that much of this progress was due to ideas which the old timers had put into practice. He urged apprentices to follow in the footsteps of the men who had set such a good example

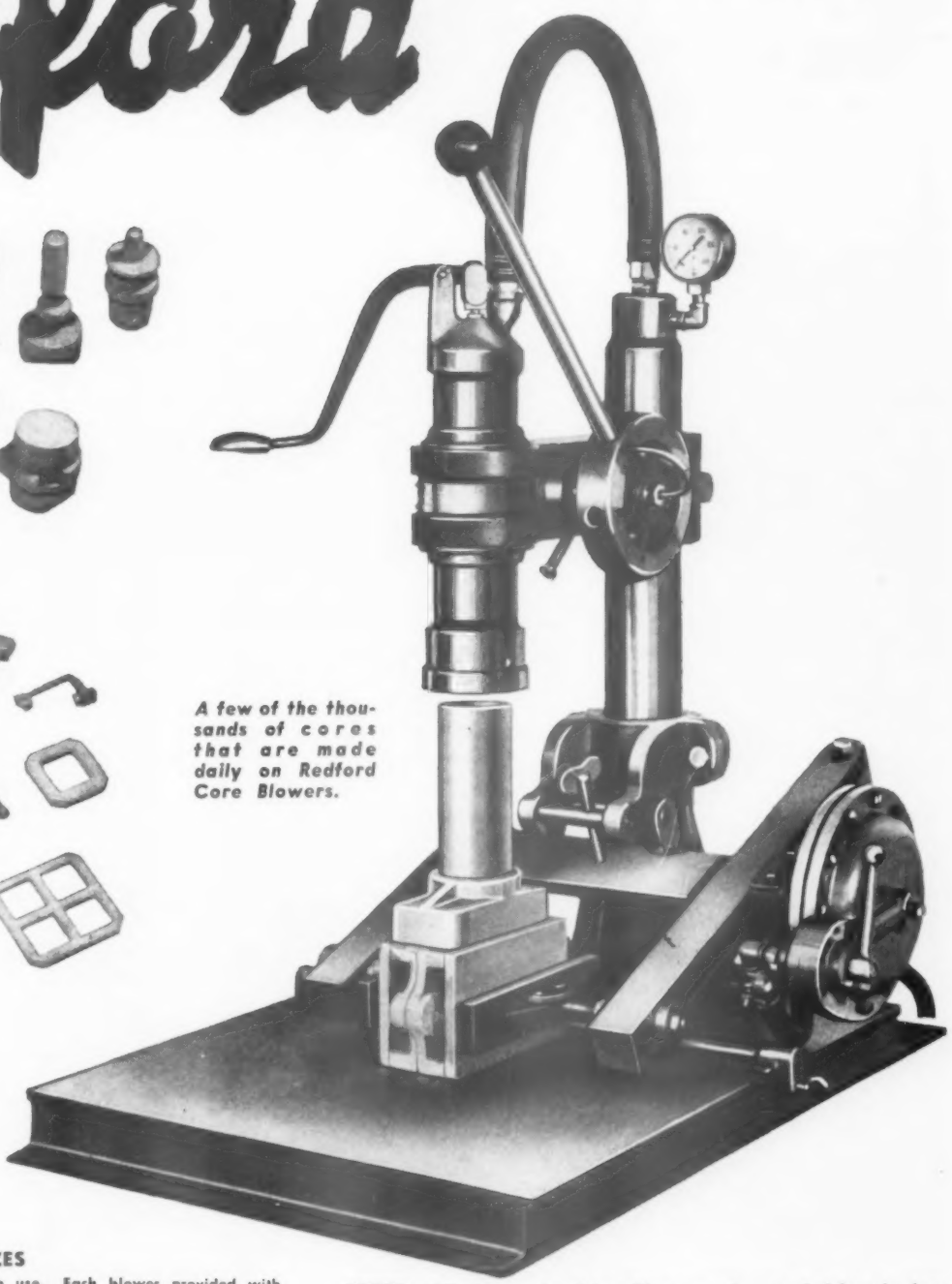
(*Continued on page* 168)



WISCONSIN Chapter of the AFS met at Schroeder Hotel, Milwaukee, Apr. 8. Left to right, top row, are: J. Hughes and J. A. Ridderhof, Frederic B. Stevens Inc.; Harold Sohner, International Harvester Co.; George Guth, General Foundries Co.; Mel Lowe, Lowe Laboratories; Frank Schneider, General Foundries Co., and T. Pehlightner, George J. Meyer Co. Middle row, left to right: Fred Katzenski and L. E. Brooks, International Harvester Co.; Carl Petty Jr., A. P. Green Firebrick Co., and William Berlin, Kohler Co. Bottom row, left to right: George Tisdale, Zenith Foundry Co.; Leon Decker, Allis-Chalmers Mfg. Co., and Robert C. Woodward, Bucyrus-Erie Co., chapter chairman. Photos courtesy W. V. Napp, Badger Firebrick & Supply Co.

Redford

CORE BLOWER CARTRIDGE TYPE



A few of the thousands of cores that are made daily on Redford Core Blowers.

SAND CARTRIDGES AVAILABLE IN 12 STANDARD SIZES

Blower comes complete, ready to use. Each blower provided with one Size "C" sand cartridge which is adaptable to a large range of core boxes. Cartridges are available in eleven additional standard sizes and special sizes furnished where needed.

WE HAVE THE "KNOW HOW" AND WILL ASSIST YOU IN SOLVING YOUR CORE BLOWING PROBLEMS

PROVEN—Hundreds of foundries are using Redfords as an efficient low cost means of producing small cores. The high percentage of reorders we receive proves that Redfords are profitable to own.

SIMPLICITY—The Redford reduces core blowing to its simplest form. Anyone can understand—operate and maintain it.

SPEED—All the work of handling core box and driers is done on the machine. Cartridges can be quickly loaded by hand. As many as 200 boxes are being blown and drawn by one operator in one hour.

FLEXIBILITY—With a Redford you can make any number of different cores without loss of time for changeovers. Here is what a large jobbing foundry has to say: "We are using 7 Redfords. Your development of the portable cartridge which can be made a part of the core box equipment, has given us all the advantages of core blowing without loss of flexibility so essential to us."

Redford IRON & EQUIPMENT CO.

PHONE: KEnwood 1-8611

20733 GLENDALE AVENUE • DETROIT 23, MICHIGAN

(*Continued from page* 166)
for them.

New officers of the chapter for the year 1949-50 were introduced and the meeting was concluded with an old time vaudevile show. Annual golf outing of the chapter will be held in July.—*John E. Hubel*

Northeastern Ohio

APPROXIMATELY 80 old timers who have served the foundry industry for 40 years or more were honored by Northeastern Ohio Chapter of the AFS at its annual Old Timers' and Past Presidents' Night, May 12, at Tudor Arms Hotel, Cleveland. Total attendance was about 300.

During the short business session which followed the dinner, Walton Woody, first president of the chapter and national AFS vice president-elect, spoke on the advantages of society membership. He pointed out that the organization provided an opportunity for young men to develop through presentation of technical papers, participation in discussions on foundry activities, and fraternization with others of the same interest. He urged members to tell other foundrymen outside the membership of the opportunities offered by the society to help themselves and others to progress.

EASTERN CANADA & NEWFOUNDLAND Chapter of the AFS recently elected new officers. Standing at left above is J. H. Newman, Newman Foundry Supply Ltd., Montreal, incoming chairman, who is being welcomed by retiring chairman, O. L. Voisard, Robert Mitchell Co., St. Laurent. At the same meeting, W. T. Shute, Canadian Car & Foundry Co., Longue Pointe, P.Q., educational committee member, presented prizes to winners in the chapter's apprentice competitions, technical paper, patternmaking and molding contests

Walter Sicha, Aluminum Co. of America, Cleveland, and chapter president, reviewed briefly the year's work and announced that the chapter had donated a piece of foundry laboratory equipment to Case Institute of Technology, Cleveland.

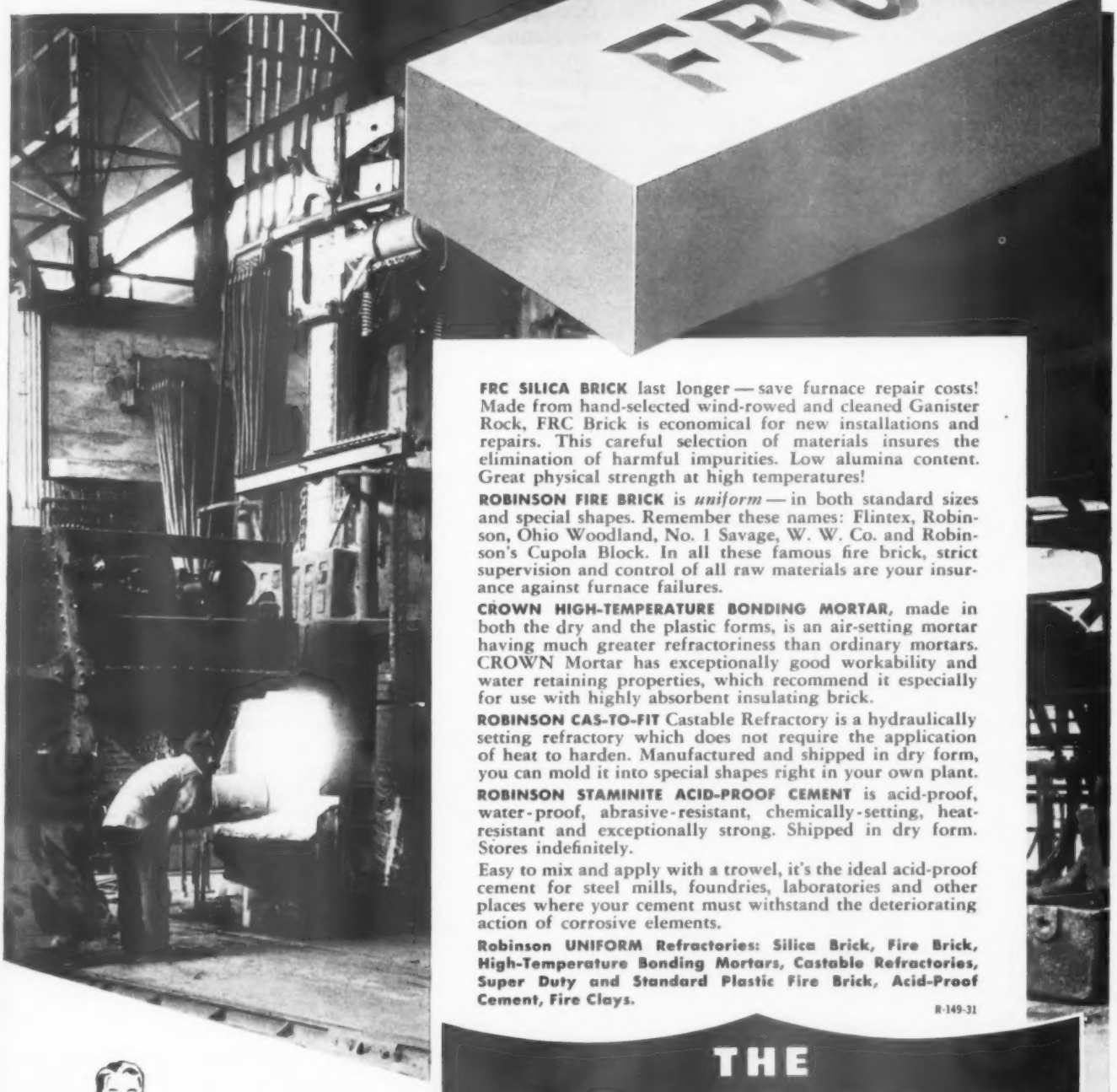
Special honor was paid to Gustav H. Zimmerman, Eberhard Mfg. Co., Cleveland, who is still active in the company after 67 years of service. D. V. Walker, general manager of Eberhard, awarded to Mr. Zimmerman a plaque certifying his years of service and a television set, which would permit him to see as well as hear broadcasts of his favorite sport—baseball.

F. Ray Fleig, Smith Facing & Supply Co., Cleveland, and chapter treasurer, awarded Mr. Sicha, retiring president, a plaque and congratulated him on behalf of the member-

(*Continued on page* 170)

NORTHEASTERN OHIO Chapter met April 14 at the Tudor Arms Hotel, Cleveland. Views of the meeting are shown here. Photos courtesy of Sterling N. Farmer, Sand Products Corp.

REDUCE REPAIR DELAYS
WITH THESE
ROBINSON *Uniform* REFRACTORIES



FRC SILICA BRICK last longer — save furnace repair costs! Made from hand-selected wind-rowed and cleaned Ganister Rock, FRC Brick is economical for new installations and repairs. This careful selection of materials insures the elimination of harmful impurities. Low alumina content. Great physical strength at high temperatures!

ROBINSON FIRE BRICK is *uniform* — in both standard sizes and special shapes. Remember these names: Flintex, Robinson, Ohio Woodland, No. 1 Savage, W. W. Co. and Robinson's Cupola Block. In all these famous fire brick, strict supervision and control of all raw materials are your insurance against furnace failures.

CROWN HIGH-TEMPERATURE BONDING MORTAR, made in both the dry and the plastic forms, is an air-setting mortar having much greater refractoriness than ordinary mortars. CROWN Mortar has exceptionally good workability and water retaining properties, which recommend it especially for use with highly absorbent insulating brick.

ROBINSON CAS-TO-FIT Castable Refractory is a hydraulically setting refractory which does not require the application of heat to harden. Manufactured and shipped in dry form, you can mold it into special shapes right in your own plant.

ROBINSON STAMINITE ACID-PROOF CEMENT is acid-proof, water-proof, abrasive-resistant, chemically-setting, heat-resistant and exceptionally strong. Shipped in dry form. Stores indefinitely.

Easy to mix and apply with a trowel, it's the ideal acid-proof cement for steel mills, foundries, laboratories and other places where your cement must withstand the deteriorating action of corrosive elements.

Robinson UNIFORM Refractories: Silica Brick, Fire Brick, High-Temperature Bonding Mortars, Castable Refractories, Super Duty and Standard Plastic Fire Brick, Acid-Proof Cement, Fire Clays.

R-149-31

Write for Robinson's new bulletin of Useful Refractories Data. It is yours for the asking! Just drop a line to The Robinson Clay Product Company, Akron 9, Ohio, for your free copy.

THE ROBINSON CLAY PRODUCT CO.
AKRON 9, OHIO

(*Continued from page* 168)

ship for a job well done. Mr. Sicha becomes the fourteenth chapter past president. Officer and director nominees listed in the June issue of THE FOUNDRY were unanimously elected.

The group then was entertained by a floor show, with music by Al Berardi and his orchestra.—*Robert H. Herrmann.*

Cincinnati

SPEAKER at the May 9 meeting of Cincinnati District Chapter of the AFS, held at the Engineering Society, Cincinnati, was C. R. Simmons, Durez Plastics & Chemicals Inc., North Tonawanda, N. Y., who discussed "Plastic Patterns," before a group of 85 members and guests. The speaker augmented his talk by slides which showed variations in types of patterns that can be made with a phenolic resin. He illustrated, by use of an accelerator, how the patterns are made, and demonstrated simplicity in duplicating patterns, ease of finishing and repatching of broken plastic patterns.

Officers, elected to serve the chapter for the year 1949-50 are: Chairman, Walter J. Klayer, Aluminum Industries Inc.; vice chairman, M. E. Rollman, Cincinnati Milling Machine Co.; treasurer, H. R. Rost, Semet Solvay Division, Allied Chemical & Dye Corp.; assistant treasurer, George A. Euskirchen, Cincinnati Foundry Co.; and secretary, Burt A. Genthe, S. Obermayer Co., all of Cincinnati.

New directors include: T. H. Erhart, Chris Erhart Foundry & Machine Co.; J. F. Kahles, University of Cincinnati; Edward H. King, Hill & Griffith Co., all of Cincinnati; C. W. Maier, Dayton Malleable Iron Co., Dayton, O.; C. Morningstar, Black Clawson Co., Hamilton, O.; H. F. McFarlin, Lunkenheimer Co., and William Oberhelman, Oberhelman Ritter Foundry Co., both of Cincinnati.—*B. A. Genthe, S. Obermayer Co.*

Oregon

OREGON Chapter of the AFS held its annual spring handicap at Broadmoor Golf Course near Portland, Oreg., Apr. 23. About 30 members turned out, and a number of trophies were awarded, going to winners of low gross and low net for members and low gross for visitors.

Winners were: George Vann, Northwest Foundry & Furnace Co., Portland, member's low gross; Hubert Templeton, Balfour Guthrie Co., Portland, member's low net, and Del Fosberg, Electric Steel Foundry Co., Portland, visitor's low gross.—*William F. Helber, Electric Steel Foundry Co.*

Rochester

ROCHESTER Chapter of the AFS held its last monthly meeting of the season May 17 at the Barnard Exempt's Club, Greece, N. Y., with over 80 members and guests present.

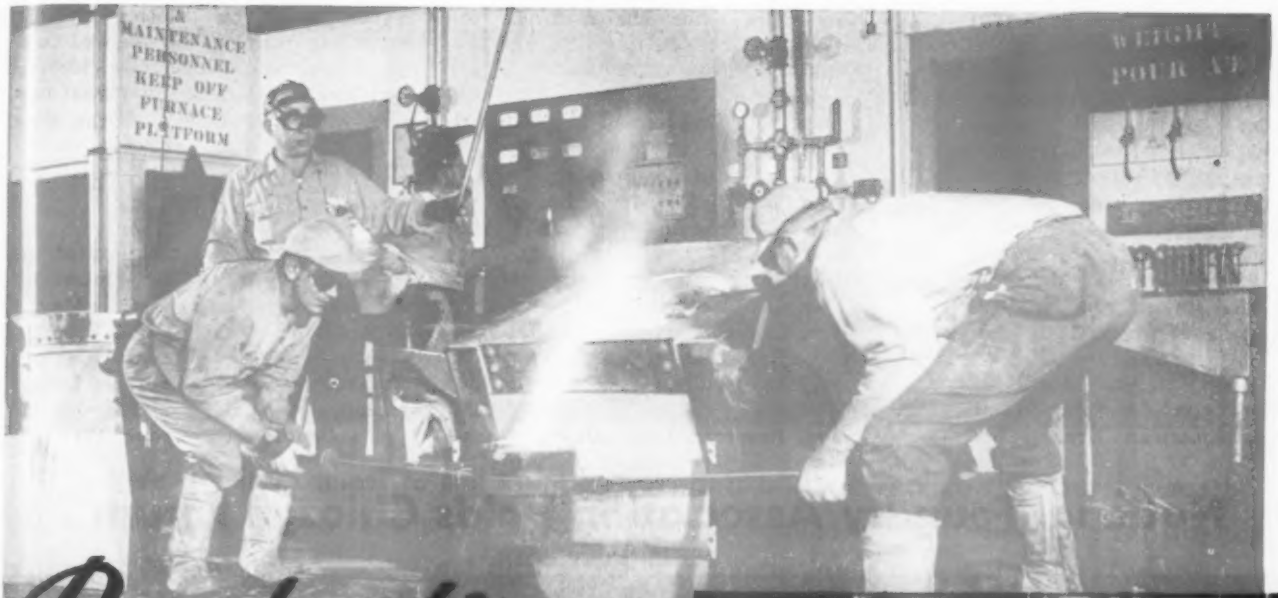
New officers elected are: President, Herman G. Hetzler, Hetzler Foundries Inc.; vice president Ken Proud, Anstice Co., and secretary-treasurer, Leon Kimpal, Rochester Gas & Electric Co. Directors are Don Webster, American Laundry Machinery Co.; Charles Benedict, Benedict Pattern Works, and Don Rishor, Charles Pettinos & Co., all of Rochester, N. Y.

Principal speaker was A. W. Gregg, Whiting Co., Harvey, Ill., who discussed youth training and encouragement. He stated that no industry today has more need of trained men than the foundry industry and no industry offers more opportunities to young men who will train for their future. In his opinion, young Americans are not afraid to get their hands dirty if they are shown where there is opportunity to advance. The foundry future lies in the engineers to develop and the metallurgists to devise the ways and means for the better melting and handling of metals.

Mr. Gregg concluded by saying that the AFS for the last three years has had a new division of education with whose help chapter educational committees should be able to carry

(*Continued on page* 172)

OREGON Chapter of the AFS held its annual spring handicap at Broadmoor golf course near Portland, Oreg., Apr. 23. At top George Vann, Northwest Foundry & Furnace Co., and Otis Grant, Electric Steel Foundry Co., watch Hubert Templeton, Balfour Guthrie & Co., drive a long one. At bottom Cliff Paulson and Tony Belusko watch Don McNeil, Electric Steel Foundry Co., sink a putt



Production Melting

WITH LABORATORY PRECISION

"Once you get the technique worked out," says one engineer who has used high-frequency melting for years, "even the toughest melting problems are reduced to routine with Ajax-Northrup's close control."

Yes, the same clean, fast induction melting principle that makes small Ajax-Northrup furnaces ideal for metallurgical research, governs the 300-lb. or the 8-ton production furnace. Fast, oxidation-free melting with no carbon contamination—perfect temperature control at all times—high efficiency and preferential power rates. If you too want laboratory precision in your production melting—at speeds you need—and costs you can afford — send for more information today.

AJAX
ELECTROTHERMIC
CORPORATION

AJAX PARK, TRENTON 5, N. J.

116

SINCE 1916

AJAX NORTHRUP
HEATING & MELTING

Associate Companies
THE AJAX METAL COMPANY • AJAX ELECTRIC FURNACE CORPORATION
AJAX ELECTRIC COMPANY, INC. • AJAX ENGINEERING CORPORATION

(*Continued from page* 170)
out a program of education.

A group of young men and women from John Marshall High School entertained with music, songs and dances during the dinner preceding the meeting.—*Herbert G. Stellwagen, Hetzler Foundries Inc.*

Metropolitan

METROPOLITAN Chapter of the AFS elected officers and directors May 9 at its annual meeting at the Essex House, Newark, N. J. Officers are: Chairman, Thomas J. Wood, American Brake Shoe Co., New York; vice chairman, D. S. Yeomans, G. F. Pettinos Inc., Philadelphia; secretary, J. F. Bauer, Hickman, Williams & Co., New York, and treasurer, D. Polderman Jr., Whiting Corp., Harvey, Ill.

New directors are: George Baer, Atlas Foundry Co., Irvington, N. J.; George F. Watson, American Brake Shoe Co., N. Y.; H. E. Voit, Sterling Wheelbarrow Co.; Walter Hartl, American Aluminum Casting Co., Irvington, and William H. Ruten, Polytechnic Institute of Brooklyn.

At the technical session following the election, William H. Johnson, U.S. Naval Research Laboratories, Washington, spoke on "Gating System for Metal Castings." He showed three color films illustrating the effect of various gating systems and what happens within the mold.—*George Baer, Atlas Foundry Co.*

Central Illinois

FINAL technical meeting of the season was held by Central Illinois Chapter of the AFS, May 9, at Jefferson Hotel, Peoria, Ill. R. G. McElwee, Iron Foundry Division, Vanadium Corp. of America, Detroit, spoke on "Engineering Properties of

(*Continued on page* 174)

National Foundry Association Holds Chicago Forum

NATIONAL Foundry Association held its Chicago Regional Foundry Forum at the Sheraton Hotel, June 1. Stevens H. Hammond (below left), president, Whiting Corp., Harvey, Ill., addressed the group on "What Is the Condition of the Foundry Business." E. B. Sherwin, president, Chicago Hardware Foundry Co., North Chicago, Ill., presided at the meeting.

Mr. Hammond, in his talk, cited foundry statistics to indicate that the industry is not only a good business but a large one too. He pointed out that the industry is doing a volume of business which is much greater than that of the immediate prewar era when business was considered normal or even good, although admittedly the volume is below its recent postwar peak.

Since it is easier to remember what prevailed a year ago than ten years ago the situation appears unduly dark. According to Mr. Hammond, the important difference lies in the fact that foundries, like other businesses, require more volume because of higher break-even points. Furthermore, high wages and wartime expanded facilities, resulting in high inventories, indebtedness and larger fixed assets for most companies, have decreased cash which industry is going to need to survive the days ahead.

He concluded by urging management to band together and develop a sound program, including an active interest in the welfare of the individual, for leading the country and its people to a better way of life.

The program also featured discussion by a labor relations panel, shown below at the right of Mr. Hammond: George E. Moredock Jr., assistant manager, labor relations department, International Harvester Co., Chicago; John Waddleton, manager labor section, legal division, Allis-Chalmers Mfg. Co., Milwaukee; A. V. Martens, president, Pekin Foundry & Mfg. Co., Pekin, Ill., and Harold E. Bruns, president, Lauson Division, Hart-Carter Co., New Holstein, Wis.

SANDS

We are in business to sell tonnages of sand and we realize that our success depends on the results you obtain. We place our sand specialists at your disposal to help you correct difficulties which may have arisen through the use of sands not suited to your particular requirements. We specialize in semi-synthetic and synthetic sands for core room and molding practice and are able to supply you with the proper sand for your needs.

AMERICAN SILICA SANDS

The American Silica Sand Company has served the foundry industry exclusively for thirty years and production at our Ottawa district pits enables us to give you prompt delivery *at any time*.

We invite your attention to the accompanying coupon. There is no obligation on your part. Give us the opportunity to cooperate with you on your sand problems.

Sold with SERVICE by these Dealers:

MAYER & OSWALD, INC.,
37 W. Van Buren St., Chicago, Ill.
Phone: Harrison 7-2040

WALTER ZEISS
=2 Armin, Webster Grove 19, Mo.
Phone: Republic 5097

LLOYD CANFIELD
1918 No. 17th St., Kansas City, Kans.
Phone: Drexel 5780

THE FOUNDRY SUPPLY CO., INC.,
404 So. Third St., Minneapolis 15, Minn.
Phone: Geneva 6337

MIDWEST FOUNDRY SUPPLY CO.,
3430 Brighton Blvd., Denver 5, Colo.
Phone: Tabor 8680

SOUTHWEST FOUNDRY SUPPLY CO.,
3612 Clinton Drive, Houston, Texas.
Phone: Capital 1697

INDEPENDENT FOUNDRY SUPPLY CO.,
2325 E. 38th St., Los Angeles 11, Calif.
Phone: Jefferson 3178

FOUNDERS SUPPLIES, INC.,
1074 Ellicott Square Bldg., Buffalo 3, N. Y.
Phone: Cleveland 4937

THE AMERICAN SILICA SAND COMPANY
Atten.: Fred G. Kramer, Technical Advisor,
Central Life Bldg., Ottawa, Illinois.

We would like information on:

- ☐ Having Engineer call
- ☐ Synthetic Sands
- ☐ Semi Synthetic Sands
- ☐ Molding Sands
- ☐ Core Sands
- ☐ Price Quotation

Name ..... Title .....

Company ..... Address .....

THE AMERICAN SILICA SAND COMPANY

Producers of Dried and Crude Silica Sands

OTTAWA, ILLINOIS

CENTRAL ILLINOIS Chapter of the AFS held its final technical meeting of the season at Jefferson Hotel, Peoria, Ill., May 9. Shown above, left to right, are: Charles Bucklar Jr., Superior Foundry Co., East Peoria, incoming chapter chairman; R. G. McElwee, Vanadium Corp. of America, Detroit, principal speaker, and F. W. Shipley, Caterpillar Tractor Co., Peoria, retiring chapter chairman. Photos courtesy of Caterpillar Tractor Co.

(*Continued from page* 172)

Cast Iron."

Mr. McElwee discussed the characteristics and reactions of additions of various alloys and pointed out the engineering properties attained by each as well as the molding problems which might be encountered.

Officers elected for the coming year are: Chairman, Charles Bucklar Jr., Superior Foundry Co., East Peoria, Ill.; vice chairman, W. G. Schuller, Caterpillar Tractor Co., Peoria, Ill., and Robert Dickison, secretary-treasurer. B. W. Branson and Henry Cakora were elected directors for three years.—*V. W. Swango, Caterpillar Tractor Co.*

Detroit

OVER 200 foundrymen and engineers attended the first Congress of Foundry Experience sponsored by Detroit Chapter of the AFS, Apr. 6. The idea of the event was a sort of open forum at which examples of defective castings were presented and those in attendance were called upon to give their opinions as to the nature and cure of such defects.

Directing the discussion and sparking the program was Harry Gravlin, Ford Motor Co., Dearborn, Mich., who has been in charge of two such similar clinics at East Lansing, Mich., and Milwaukee. Perhaps 30 or 40 of those present were moved to give opinions and comment on castings defects under consideration. A complete transcript of all discussion was made, and the congress committee, headed by Jess Toth, Harry W. Dietert Co., Detroit, plans to mail copies to those who attended.

Officers elected at the May 20 meeting are: Chairman, R. J. Wilcox, Michigan Steel Casting Co., Detroit; vice chairman, Jess Toth, Harry W. Dietert Co., Detroit; secretary, J. N. Phelps, Vanadium Corp. of America, Detroit, and treasurer, E. J. Passman, Frederic B. Stevens Inc., Detroit.

Directors elected to serve three-year terms are: Ralph Barker, Wilson Foundry & Machine Co., Pontiac, Mich.; Crary Davis, Aluminum Co. of America, Detroit; Harry Gravlin, Ford Motor Co., Dearborn, Mich., and Willard E. Kidwell, Packard Motor Car Co., Detroit.

Central Indiana

ELECTION of officers for the 1949-50 season featured the May 23 meeting of Central Indiana Chapter of the AFS at the Athenaeum, Indianapolis. It was the final meeting of the current season.

Officers elected are: S. F. Swain, Golden Foundry Co., Columbus, Ind., chairman; Jack W. Giddens, International Harvester Co., Indianapolis, vice chairman; Ray Fickenworth, C. & G. Foundry & Pattern Works, Indianapolis, treasurer, and Paul Faulk, Electric Steel Castings Co., Indianapolis, secretary.

Directors with terms expiring in 1952 are: Richard Frazee, Spickelmier Co.; James Barrett, National Malleable & Steel Castings Co.; Robert Langsenkamp, Langsenkamp-Wheeler Brass Works, and Don Moore, C. & G. Foundry & Pattern Works, all of Indianapolis. Fred Carl, Allison-Bedford Foundry Division, General Motors Corp., Bedford, Ind., was elected a director with term to expire in 1951.

(*Continued on page* 176)

National Castings Council Elects Officers

Collins L. Carter, president, Albion Malleable Iron Co., Albion, Mich., has been elected president of the National Castings Council and William L. Dean, president, Mathews Conveyer Co., Ellwood City, Pa., has been elected vice president. F. Ray Fleig, president, Smith Facing & Supply Co., Cleveland, was re-elected treasurer and Frank G. Steinebach, editor of THE FOUNDRY, Cleveland, was re-elected secretary.

In addition to his duties as president of the National Castings Council, Mr. Carter is president of the Malleable Founders' Society. He succeeds Howard A. Stockwell secretary, Barbour Stockwell Co., as council president. Mr. Dean, vice president of the council, is president of the Foundry Equipment Manufacturers Association.

WILLIAM L. DEAN

COLLINS L. CARTER

MERRITE
PIG IRON

LIVING UP TO ITS NAME

MORE USED THAN ANY OTHER MERCHANT PIG IRON

SIXTY-SIX YEARS OF
SERVICE TO INDUSTRY

PICKANDS MATHER & COMPANY
UNION COMMERCE BUILDING • CLEVELAND 14, OHIO
CHICAGO • CINCINNATI • DETROIT • DULUTH • ERIE • GRAND RAPIDS • TOLEDO
GREENSBORO • INDIANAPOLIS • MINNEAPOLIS • ST. LOUIS • WASHINGTON
IRON ORE • PIG IRON • COAL • COKE

Comfort that pays for itself...

Many times over

The *Improved* WILLSON FOUNDRY GOGGLES

The mask of high grade, soft, pliable leather fits any face and head size. And it distributes the shock of impact over a wide area. Fitted with WILLSON Super-Tough* lenses, of course, for maximum eye protection.

for Dusty Jobs

Style DL48

Indirectly ventilated with four baffled and screened ports in the eyecups. They permit the entrance of air— exclude dust, grit and other flying particles.

for Hot Jobs

Style DL31

Deep eyecups are well perforated to permit free air circulation to reduce fogging. Corduroy bound edges absorb perspiration. Particularly adaptable for men working under high temperature conditions in many foundry and steel mill operations.

For more complete information about these and other WILLSON eye and respiratory protective equipment, get in touch with your Willson distributor or write us direct.

WILLSON®

"Established 1870" *T. M. Reg. U. S. Patent Office

WILLSON PRODUCTS, INC., 237 WASHINGTON STREET, READING, PA.

(*Continued from page* 174)

C. A. Sanders, vice president American Colloid Co., Chicago, was principal speaker of the evening. He spoke on "Proper Use of Foundry Sands." He discussed the value of proper sand usage and the dangers of improper sand control. His talk was illustrated with slides.

William B. Ziegelmueller, Raymond S. Davis and H. H. Lurie, former chapter chairmen, were honored at the meeting.—*W. K. Mitchell.*

Philadelphia

APPROXIMATELY 125 members and guests attended the May 13 meeting of Philadelphia Chapter of the AFS, at the Engineers Club, Philadelphia. A round-table discussion on "Cleaning Department Problems" was led by A. N. Kraft, Wilkening Mfg. Co., Philadelphia. Panel was composed of C. R. Sweeney, Atlantic Steel Castings Co., Chester, Pa., who represented the steel group; W. D. Bryden, Philadelphia Bronze & Brass Corp., Philadelphia, representing nonferrous foundrymen; and A. O. Butler, Florence Pipe Foundry & Machine Co., Florence, N. J., spoke for the cast iron group.

Numerous questions and answers indicated that the cleaning department is important in every foundry and efficient cleaning of castings presents many problems.

C. L. Lane, Florence Pipe Foundry & Machine Co., Florence, N. J., retiring chairman of the chapter, introduced the new officers for the year 1949-50. These include: Chairman, W. A. Morley, Olney Foundry Division, Link Belt Co., Philadelphia; vice chairman, C. B. Jenni, General Steel Castings Corp., Chester, Pa.; secretary-treasurer, W. B. Coleman, W. B. Coleman & Co., Philadelphia. New directors are C. R. Tinsley, U. S. Pipe & Foundry Co., Burlington, N. J., and A. N. Kraft, Wilkening Mfg. Co., Philadelphia.—*A. J. Saute, American Engineering Co.*

Birmingham

SCABS, Buckles and Spalls" was the title of a paper presented by J. B. Caine, Sawbrook Steel Castings Co., Cincinnati, before the Birmingham District Chapter of the AFS at its April meeting. The talk was highlighted by numerous slides illustrating a simple testing procedure whereby the behavior of sand in the cope of the mold and also the sand in contact with the molten metal could be correlated and its performance predicted .

Joe T. Gilbert, nominating committee chairman, reported chapter nomi-

nations for the coming year. They are: Chairman, C. P. Caldwell, Caldwell Foundry & Machine Co.; vice chairman, Morris Hawkins, Stockham Valves & Fittings Inc., and secretary-treasurer, Fred K. Brown, Adams, Rowe & Norman. Directors include: W. Guy Bagley, Woodward Iron Co.; R. R. Deas, Hamilton Research Co.; H. W. Gethin, Alabama Clay Products Co., and James T. MacKenzie, American Cast Iron Pipe Co.

The entire slate was elected unanimously at the May 20 meeting at Tutweiler Hotel, Birmingham, with approximately 75 members and guests present.

Principal speaker at that meeting was C. A. Sanders, vice president, American Colloid Co., Chicago, who talked on "Foundry Sand Practice." —*J. P. McClendon, Stockham Valves & Fittings*

Tri-State

FINAL business meeting for the Tri-State Chapter of the AFS was held in Coffeyville, Kans., on May 20. The meeting was designated as "Acme Foundry Night" in recognition of their splendid attendance for the year. H. E. Elliott of the Dow Chemical Co., Midland, Mich., was the principal speaker and his discussion on magnesium foundry practices was supplemented with a group of pictures of actual foundry jobs. A question-and-answer period followed the program.—*F. E. Fogg, Acme Foundry & Machine Co.*

Reading

REGULAR meeting of Reading Foundrymens' Association was held at the Berkshire Hotel, Reading, Pa., Apr. 19. Ralph R. Meigs, Liberty Mutual Insurance Co., Boston, spoke on "Better Accident Prevention—Better Foundries." It is Mr. Meigs' opinion that a great deal can be accomplished by management toward making foundries "good places to work" by directing more effort and attention to accident prevention.

He stated that safety is not just a matter of wearing safety glasses or shoes; it is a matter of education in the proper method of performing the job.

L. W. Eastwood, Battelle Memorial Institute, Columbus, O., was the principal speaker at the May 17 meeting at Berkshire Hotel, Reading, Pa. His subject was "Casting Unsoundness Caused by Gas Evolution," and he explained in detail the necessity for elmininating gases when pouring to produce more sound castings. He illustrated his talk with

"CERTIFIED"
does a better
cleaning job for us
A better cleaning job for us... that's the comment you'll hear from owners, purchasing agents and foremen alike. They all agree, Certified Abrasives get castings really clean, efficiently produce a better surface. Yes, Certified Abrasives really keep blast cleaning costs at rock bottom.
FOREMAN
Blast cleaning is easier with Certified. Both Samson Shot and Angular Grit can be used over and over again. With them on your job you get more work done ...every day. Order Certified today for better cleaning!
100 LBS.
ANGULAR
GRIT
PITTSBURGH STEEL CO.
PITTSBURGH, PA U.S.A.
USE NO HOOKS
BOSTON, MASS.
U.S.A.
USE NO HOOKS
Always specify "Certified"
ACCEPTED AND USED FOR OVER 55 YEARS.
PITTSBURGH CRUSHED STEEL CO.
PITTSBURGH, PA
STEEL SHOT AND GRIT CO.
BOSTON, MASS.

slides.

Approximately 100 members and guests attended this concluding meeting of the season.—*William I. Cassidy*

Western New York

WESTERN New York Chapter of the AFS heard Prof. Daniel H. Gray, lecturer in economics, University of Buffalo, speak at the chapter's regular meeting at the Sheraton Hotel, Buffalo, Apr. 15. Title of the talk was "The Human Factor in Industrial Safety."

Professor Gray listed causes of industrial accidents as familiar routine, poor eyesight, poor equipment, deadening repetition, and other similar factors. Mishaps are committed; they don't just happen. He recommended screening of prospective employees for placing people in the proper place to avoid accidents. Aptitude tests should be made to match the individual to the job. Furthermore, men should be rotated on jobs to counteract monotony.

Employees should be made to realize that they are doing something significant, that they "belong," and are not merely cogs in a machine. The speaker concluded by saying that fatigue rest periods are important in building worker morale.—*Roger E. Walsh, Hickman, Williams & Co.*

New Grinding Wheel Booklet Published

A new booklet on the subject of "Safe Speeds for Grinding Wheels" has just been published by the Grinding Wheel Institute. It is one of a series devoted to various aspects of safety in the use of grinding wheels which is being prepared by the Safety Committee of the institute.

The new booklet is not a technical treatise on the strength of materials as applied to grinding wheels, nor on the stresses imposed on rotating bodies. It is, rather, a nontechnical discussion written especially for the average shop man to help him better understand why all wheels cannot be operated safely at the same speed, and why it is important that the maximum operating speed recommended by the wheel manufacturer be not exceeded.

Much of the material in the booklet is taken directly from the American Standard Safety Code (B7.1-1947) but there is also much additional explanatory matter. For instance, there is a simple diagrammatic explanation of the difference between "peripheral speed" and "revolutions per minute" and a simple rule for converting one to the other. This rule can readily be memorized for use when conversion tables are not available or when the available tables do not show the exact size or speed for which an accurate conversion is required. This rule is simply this: Surface feet per minute = .262 × diameter in inches × rpm.

In other words, to obtain the surface speed in feet per minute, multiply the diameter in inches by the rpm and then multiply the result by .262.

Then there is a graph illustrating how the stresses from centrifugal force increase as the square of the velocity. This leads to a discussion of the factor of safety and the difference between the "true factor of safety" and the "established factor."

The booklet contains a brief paragraph explaining the effect of speed changes on the grinding action of a wheel and the statement that the most efficient speed is usually a safe speed. To illustrate this statement, an interesting example of an actual case is cited. It explains how the speed of a certain important machine was reduced by one-third after it was discovered that the speed was so high that wheel breakages were resulting. It was then discovered that instead of reducing the productivity of the machine as feared, it was possible actually to increase it by one-third.

The booklet does not contain anything new, but tells an old story in an interesting manner that should prove helpful to anyone who has anything to do with grinding wheels or any responsibility for their safe operation.

The new booklet is one of a series of which the following have already been published: "Mounted Wheels and Points (Safe and Efficient Operation)"; "High Speed-Heavy Duty Grinding Machines (Maintenance of)"; "Portable Grinding Machines (Safe and Efficient Operation)"; "Handling, Storage and Inspection of Grinding Wheels".

Other contemplated booklets in the series on which some work has been started include "Disc Grinding" and another on the important subject of "Mounting." These booklets all represent the collective experiences and recommendations of various members of the Grinding Wheel Institute, which have been carefully compiled by the Safety Committee of the institute. They are presented to industry in the general interest of safety. Copies may be obtained without charge from any grinding wheel manufacturer who is a member of the institute or from the Grinding Wheel Institute Office, P.O. Box [illegible], Greendale, Mass.

The booklet on "Portable Grinding Machines" was reviewed in detail in an article by R. B. Fair in THE FOUNDRY for September 194[illegible]. Others will be reviewed in these columns as they become available.

Develops Squeeze Molding Calculator

W. W. Eichenberger, eastern representative, Milwaukee Foundry Equipment Co., Milwaukee, recently developed a slide rule calculator for determining the correct relationship between piston diameter in a squeeze molding machine, line air pressure, flask area and the mold sand pressure desired.

According to Mr. Eichenberger, it is a simple tool, providing a quick and easy method of calculating proper values. It was developed as a help to foundrymen in avoiding overloading squeeze machines and expecting proper results by using a large flask and small squeeze piston.

The instrument calculates, from one setting, piston diameters required from 10 to 30 in. for flask areas ranging from 100 to 2500 sq in. Air pressure range is from 70 to 130 psi and sand pressure range is from 20 to 80 psi. Minimum recommended sand pressures to be used with various metals also are given on the rule which is available on application to Milwaukee Foundry Equipment Co., 3238 West Pierce St., Milwaukee 4.

Book Review

High-Speed Photography, published by the Society of Motion Picture Engineers, New York, paper, 120 pages, 6 x 9 in. Price $1.50.

Consisting of papers presented at the symposium on high-speed photography during the October, 1948, convention of the Society of Motion Picture Engineers, this book describes various high-speed cameras, accessories, and techniques used by governmental and industrial agencies. The papers form the foundation for high-speed photographic work and cover motion picture and still photography.

Specific topics discussed in the book include electrical flash photography and a new high-speed stroboscope, lamps for high-speed photography, motion picture equipment for very high-speed photography, methods of analyzing high-speed photographs and the uses of high-speed photography in the armed forces, automotive and other industries and research.

LINE-UP TROUBLES DISAPPEAR

with UNIVERSAL FLASK PINS AND BUSHINGS FOR COPE AND DRAG

Accurate and speedy lineup of cope and drag, saving valuable production minutes, is the experience of the foundry that uses Universal Flask Pins and Bushings. Once installed, they *maintain their stability and accuracy* for hundreds of castings. Cope Bushings are quickly guided to Drag Pins over tapered, loose-fitting Closing Pins which are easily removed after assembly. The special elongated flask bushing permits longitudinal expansion to compensate for metal heat *without affecting accurate alignment.* Universal Flask Pins and Bushings are available from stock in standard sizes for iron, steel, aluminum and magnesium flasks. Special sizes and types to order. Send for folder and complete information.

UNIVERSAL ENGINEERING COMPANY

FRANKENMUTH 4, MICHIGAN

NATIONAL OPEN HEARTH CONFERENCE

Considers Operating Problems

By EDWIN BREMER
Metallurgical Editor
THE FOUNDRY

NEARLY 1300 attended the 32nd annual conference of the National Open Hearth Steel Committee and Blast Furnace, Coke Oven and Raw Materials Committee of the American Institute of Mining and Metallurgical Engineers held at the Palmer House, Chicago, Apr. 18 to 20.

At the opening session, E. G. Hill, Wheeling Steel Corp., Wheeling W. Va., stated that despite handicaps of poor scrap and other raw materials the steel industry produced 80½ million tons of ingots and castings last year through better furnace combustion, more rapid rebuilding of open-hearth units, use of oxygen, and efficient management.

The McKune award was presented to T. D. Winkler, Bethlehem Steel Co., Bethlehem, Pa., for his paper, "Liquid Iron and Steel Temperatures in Practice". Honorable mentions were given to Russell Fayles, Lukens Steel Co., Coatesville, Pa., and to Fred Jaikes, Inland Steel Co., East Chicago, Ind.

Aluminum Affects Temperature

Mr Winkler said that rate of change of bath temperature depends on heat loss from the furnace, temperature difference between flame and bath, and amount of fuel being burned. Use of oxygen instead of ore provides more rapid increase in bath temperature, and addition of cold materials reduces the temperature of the bath, although addition of 1500 lb spiegel to a 135-ton heat caused no change. Measurements of various grades of heats killed with 3¼ lb aluminum per ton showed no temperature drop from furnace to ladle, while additions of 2½ lb aluminum per ton to the ladle resulted in a temperature drop of 20°.

At the following session on acid open-hearth operations under the direction of C. F. Christopher, Continental Foundry & Machine Co., East Chicago, Ind., and H. E. Dowie, Mesta Machine Co., Homestead, Pa., a number of speakers presented brief discussions on various topics. Guy M. Neagley Jr., Pittsburgh Rolls Division, Blaw-Knox Co., Pittsburgh, pointed out that primarily the fluidity of a given steel is a function only of the temperature. Difficulty in ascertaining that fact lies in the numerous factors affecting reproducibility of tests. These include the types of molds—whether rod or spiral type—the mold materials, type of flow such as straight or helical or a combination of both, surface films and inclusions, iron oxide content as well as composition.

F. H. Allison Jr., United Engineering & Foundry Co., Pittsburgh, stated that, so far as he could determine, late additions of ore to the furnace bath are not detrimental to the surface conditions of the castings. Ore added 21 to 31 minutes before tapping gave the same results as when added 50 minutes before tapping. However, S. E. Mueller mentioned he had found that an ore addition 15 minutes before tapping reduced the manganese content, and resulted in poor castings.

R. W. Divine, Erie Forge Co., Erie, Pa., in discussing "Furnace Practice May Be Identical for Either Ingots or Castings," said that while much depended upon availability of raw materials and the economy of production, he believed the same practices could be employed for making either ingots or castings of equal quality. Many in the audience disagreed, stating that furnace deoxidation methods, as well as ladle practice, differ for ingots and castings.

According to T. J. Ondocsin, Mackintosh-Hemphill Co., Midland, Pa., foaming acid open-hearth ladle slags have no connection with the gas content of the metal, the trouble being due to the reaction of active oxides with carbon at the slag-metal interface. G. S. Baldwin, Standard Steel Works Division, Baldwin Locomotive Works, Burnham, Pa., said the type of scrap available at present gives too wide a variation in carbon content to permit melting down to "go ahead" analysis. Usually additions have to be made to the melt and the metal held in the furnace to secure temperature. He found that working the heat fast to obtain a boil, causing a 60-point drop in carbon per hour, resulted in a steel with the best physical properties.

A session on "Cold Metal Operations and Basic Foundry Practice," with H. S. Hall, Lukens Steel Co., Coatesville, Pa., and A. H. Sommer, Keystone Steel & Wire Co., Peoria, Ill., as chairmen, dealt with scrap preparation and charging practice; furnace design for cold metal shops; use of oxygen and compressed air in cold metal shops; use of multiple burners, and bath temperature pyrometers.

In discussing scrap preparation and charging, William Schwinn, Keystone Steel & Wire Co., stated that placing charging boxes on the ground to permit filling the ends gave a weight increase of 1500 lb per box and permitted a reduction of 1½ hr in charging time on a 175-ton furnace. W. H. Steinheider, Sheffield Steel Corp., Kansas City, Mo., described the arrangement of the scrap separation yard to eliminate difficulty in loading charging boxes. R. C. Solomon, Granite City Steel Corp., Granite City, Ill., pointed out that poor scrap necessitated an increase in the number of boxes charged due to lack of density, and unless there is an improvement in the scrap, the high scrap users will have to increase facilities to prepare scrap suitable for dense loading of charging boxes.

Keep Flame Down

O. P. Luetscher, Keystone Steel & Wire Co., Peoria, Ill., described a cold metal furnace having large doors and high roof. Doors are limited to 54 in. high to hold the skewback to 60 in. high, and the doors have water-cooled sills and top frames. Hearth is 38 x 15 ft at the slag line, and capacity is 168 net tons. Ends of the furnace were designed to permit full development of the flame before it struck the scrap, and the flame is kept down to protect the roof. It was found that in the checker chambers the inlet and outlet on the same side gives better distribution of heat.

L. L. Whitney, American Steel Foundries, Alliance, O., stated that on an experimental basis with an oil-oxygen flame, using 450 cu ft of oxygen per ton of steel, more rapid melting was secured. It was found that checker heat increased, resulting in hotter heats with improved refractory costs. However, poor scrap results in slower charging with the result that the flame plays on the unmelted material, increasing amount of oxides and refractory trouble. Injection of oxygen with a water-cooled lance provided a 10 per cent increase in production. The lance decreased splash and turbulence as well as admittance of greater oxygen feed. E. H. Reyer, Keystone Steel & Wire Co., Peoria, Ill., described injection

(Continued on page 182)

Brief Notes for Busy Foundrymen

Which is it?

Is it a blow, a cold shut, a misrun, or was it poured short? It could be any one and yet be improperly identified. After the gates are removed, what is it? Often when a side floor pattern is placed on the mechanized line such a defect may appear. For example, say a small thin casting that contains one, two, or three small oil sand cores is showing a high loss said to be a "blow". There are eight of these castings on the runner and the in-gate is small. One pin core in these castings is farthest from the runner and the surrounding metal in a thin section. It is said that these cores are "blowing".

On the side floor the molder does his own pouring. What is the difference between the floor molding and the line molding? Naturally bonded sands are used on the side floor, synthetic sands on the mechanized line. The line sand is rammed hard, the side floor naturally bonded sand is rammed soft. Why? The side floor molder pours his own floor, the line molder doesn't. Everything is poured in the same manner—hard and fast. The side floor molder has learned that hard ramming produces "blows" or "misruns", as the sand becomes too "dense" and "too tight" for the core gas to escape. He also found that if he rams "soft" the metal will penetrate unless he "pours soft".

What does he do?

In order to prevent penetration, rough casting, fissures and fines from hard pouring—he cuts a small sprue. He reduces ferrostatic pressure. He pours very close to the mold. He "chokes" the pouring. Therefore, the soft ramming allows the core gasses to escape better, and the soft pouring prevents rough casting surface. On the line, the hard ramming doesn't allow the core gasses to escape properly, and soft ramming cannot be allowed as everything is poured in the same manner—hard. In order to obtain good finish, the molds must be rammed hard.

What then must we do? First, relieve the trouble. If the core gas is causing backward pressure, vent the cores to the parting line. Put the vent on the pattern. Second, increase the cope to exert more pressure. Third, increase the size of the sprue. Fourth, raise the ladle slightly to increase ferrostatic pressure further. Probably the core venting will be sufficient, but one of the others will also help.

Remember—hard ramming and finer sands to give better finish mean fewer voids to accommodate core gas—or any mold gas. Venting is essential. Vent to the parting line. Sand composition—ramming—pouring—venting—all go together. Do not change one without considering the others!

Our New Address • Merchandise Mart Plaza • Chicago 54, Illinois

VOLCLAY Western Bentonite • FIVE STAR Wood Flour • PANTHER CREEK Southern Bentonite

AMERICAN COLLOID COMPANY Chicago Illinois • Producers Since 1927

Available from Leading Foundry Suppliers in the United States and Canada

TURN DUST INTO PROFITS*

Hundreds of plants have done it... with Pangborn Dust Control!

*** PROFIT $13,951**

Pangborn Dust Control eliminates dust, pays for its operation, and *earns $13,951 each year* on charcoal salvage for this manufacturer!†

*** PROFIT $12,752**

In a large grain mill, Pangborn Dust Control eliminates dust hazards and *earns a profit of $12,752* annually, salvaging grain formerly lost as dust!†

*** PROFIT $7,691**

Based on operating costs before and after Pangborn Dust Control was installed, savings, other than salvage, for this metal plant *run $7,691 a year!*†

*** PROFIT $5,103**

Asbestos salvaged to the tune of *$5,103 yearly* . . . dust completely eliminated . . . that's the Pangborn Dust Control profit story for this Asbestos manufacturer!†

† Name upon request.

HOW ABOUT YOUR PLANT?

Let us make a "Dust Pocket" survey in *your plant*. There's no obligation! Pangborn engineers show you how the right Pangborn Dust Control equipment saves you money . . . boosts your profits! For full information and your *free copy* of Bulletin 909A on the control of industrial dust, write today to: PANGBORN CORPORATION, 300 Pangborn Blvd., Hagerstown, Maryland.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment.

STOP THE DUST HOG from stealing profits with

Pangborn

DUST CONTROL

(*Continued from page* 180)

of 450 cu ft of oxygen per minute for a 40 minute period in melting. Injection was carried on at the firing end and consumed 70 ft of 1-in. pipe. He found that sulphur was 0.010 to 0.015 per cent lower with oxygen injection than without. Flame enrichment with oxygen on an experimental basis cut charging time from 6 hours to 5.

Another session, presided over by D. L. McBride, Bethlehem Steel Co., Johnstown, Pa., and G. H. Todd, Armco Steel Corp., Ashland, Ky., was devoted to discussion of the metallurgy of the open-hearth process. First paper on "Deoxidation Practice for Killed Steels," by L. R. Silliman and H. J. Forsyth, Republic Steel Corp., Cleveland, was presented by Mr. Silliman. It was concerned primarily with production of ingots having good surface quality. Steel was C-1117, coarse grain type, and it was found that use of a 3000-lb silicomanganese block on a 110-ton heat with 4 oz of aluminum per ton in the ladle gave satisfactory results, provided recarburization was not over 0.05 per cent C. In a written discussion G. L. Plimpton, Inland Steel Co., pointed out that with fine-grain steel the use of 20 lb silicomanganese and 8 lb 15 per cent ferrosilicon per ton gives improved surface results attributable to the additional silicon employed.

Quiescent Bath Causes Foaming

In a discussion of the mechanism of foaming, B. M. Larsen, U. S. Steel Corp., Kearny, N. J., said it apparently is due to lack of a rolling boil resulting in a quiescent bath. As a result the carbon in the top surface of the metal is reacted upon by oxygen from the slag above, creating a surface boiling or foaming. J. S. Marsh, Bethlehem Steel Co., Bethlehem, Pa., said he thought foaming is due to the temperature of the slag being too cold to release bubbles of gas given off by the molten metal beneath. C. E. Sims, Battelle Memorial Institute, Columbus, O., stated that foaming is purely a physical condition wherein the slag contains stable bubbles, possibly the result of temperature or composition. It was indicated that foaming could be corrected by the addition of silicon carbide to the slag at the proper time. The exothermic reaction resulting from the silicon carbide addition apparently puts the slag in a condition whereby the bubbles are released without foaming.

At a subsequent session Mark Geigel, Youngstown Sheet & Tube Co., Youngstown, O., and J. R. Brady, Wisconsin Steel Works, Chicago, were

chairmen. D. A. Farrell, Carnegie-Illinois Steel Corp., Chicago, presented a paper on "Single Objective Safety," giving procedures in setting up safe practices. He said the first thing to do is to get all the facts relating to accidents. With those data the critical situations can be determined. Study will indicate the best means to eliminate the accidents, and then the desired safe practice is established—and enforced.

In a paper on "Effect on Quality of Elapsed Time Between Last Oxygen and Tapping," C. G. McCabe, Wheeling Steel Corp., Steubenville, O., said he could find no difference in quality even when oxygen still was being added while the metal was coming out of the furnace. Experiments where the oxygen supply was cut off from 7 to 41 minutes before tapping showed the same quality as far as he could determine.

S. C. Faddis, Jones & Laughlin Steel Corp., Pittsburgh, presented data which showed that nitrogen additions to low-carbon steels increase the tensile strength, yield point and hardness, best results being obtained with a nitrogen content from 0.008 to 0.010 per cent. He pointed out that in regular open-hearth practice the steel contains 0.003 to 0.006 per cent N while in the bessemer converter practice the steel contains 0.011 to 0.020 N. Nitrogen additions to open-hearth steels can be accomplished with calcium cyanamid or urea.

The 1950 conference of the Nation Open Hearth Committee will be held in Cincinnati during the month of April. Exact time will be announced later.

Magnesia Insulation Manual Ready

Magnesia Insulation Manufacturers Association has published a 96-page manual on 85% Magnesia Insulation, illustrated with line drawings and photographs. Subjects covered include: Properties of 85% Magnesia; Determination of Correct Thicknesses; Application and Finishing Procedures; and Insulation Maintenance. Appendix contains a discussion of practical applications of heat transmission theory, definitions of technical terms, 15 tables of data on 85% magnesia and related subjects, glossary of trade terms, and a list of trade names of insulating material and accessory products. Requests for copies should be made to the association, 1317 F St. N. W., Washington 4, D. C., on business letterhead, giving title of individual making request.

Prompt shipment—unlimited quantities now available to foundries from BAROID—the world's largest producer of Bentonite. Our modern plants are geared to fulfill every requirement of the foundry trade.

From THESE APPROVED DISTRIBUTORS

American Cyanamid Co.
New York, New York

The Asbury Graphite Mills, Inc.
Asbury, New Jersey

Barada & Page, Inc.
Kansas City Missouri (main office)
Also—(Branches)
Tulsa, Okla.
Oklahoma City, Okla.
Wichita, Kansas
Dallas, Texas
Houston, Texas
New Orleans, La.

G. W. Bryant Core Sands, Inc.
McConnellsville, New York

Canadian Industries, Ltd.
Montreal, Quebec, Canada
(all branches)

Casco S. de R. L.
Mexico, D. F.

The Foundries Materials Co.
Coldwater, Michigan
Also Detroit, Michigan

Foundry Service Company
North Birmingham, Alabama

Foundry Supplies Co.
Chicago, Illinois

Thomas H. Gregg Company
Milwaukee, Wisconsin

Independent Foundry Supply Co.
Los Angeles, California

Industrial Foundry Supply Co.
San Francisco, California

Klein-Farris Co., Inc.
Boston, Massachusetts
New York, New York
Hartford, Connecticut

LaGrand Industrial Supply Co.
Portland, Oregon

Marthens Company
Moline, Illinois

Carl F. Miller & Co.
Seattle, Washington

Pennsylvania Foundry Supply & Sand Co.
Philadelphia, Pennsylvania

Robbins & Bohr
Chattanooga, Tennessee

Smith-Sharpe Company
Minneapolis, Minnesota

Southwest Foundry Supply Co.
Houston, Texas

Mr. B. J. Steelman
Chicago, Illinois

Stoller Chemical Co.
Akron, Ohio

Wehenn Abrasive Co.
Chicago, Illinois

Mr. Walter A. Zeis
Webster Groves, Missouri

BAROID
SALES DIVISION
NATIONAL LEAD COMPANY

BENTONITE SALES OFFICE:
RAILWAY EXCHANGE BLDG.
CHICAGO 4 • ILLINOIS

Static Properties of Cast Steels

(*Continued from page* 73)

$Y = 0.78369\ T - 1.19$. For quenched and tempered steel (14): $Y = 0.93819\ T - 2.15$.

Y is the yield point or yield strength and T the tensile strength, both in 10,000 psi units. The loci of (13) and (14) are shown in Fig. 7 and intersect near $T = 6.2$ (62,000 psi). This is near the intersection of the loci for the reduction of area-tensile relation, pointing to the close connection of yield strength and reduction of area. At tensile strengths under 62,000 psi the yield strength in the quenched and tempered state is lower than that of normalized and tempered. Generally, however, in most of the useful strengths the reverse is true.

The application of the above formulas is limited to steels tempered at or above 500° C (935° F). In the quenched steels, tempering at 300° C (570° F) gives results agreeing with (14) at strengths around 70,000 or 80,000 psi and near 200,000 psi, but at intermediate values of T around 16 (160,000 psi) the yield strength is much below the calculated value. Some curvilinear form of locus would be required. At a tempering temperature of 400° C (750° F) the relation is nearly a straight line, but at somewhat lower yield strengths for a given tensile strength, that required by (14). The scatter for normalized steels is greater than for quenched steels.

Having so far considered relationships applying to steels in general, it is time to bring into the picture the effect of chemical composition. So far we have discussed certain first approximations as to relation of elongation (2) and reduction of area (2) to tensile strength; of maximum obtainable elongation (5) (6); reduction of area (7) (10) (given unlimited freedom of choice) to tensile strength; yield strength to tensile strength (13) (14) and brinell number to tensile strength (1). We do not yet know what elongation or reduction of area would accompany a given tensile strength in a given steel, since the value of a and b (2) (they differ for elongation and reduction of area) are functions of chemical composition. Also it is as yet an open question in this discussion, whether the general relations so far developed require modification as chemical composition changes.

Our observations permit of the calculation (least squares) of a and b for each steel and the evaluation of a and b in terms of composition by the same means. One can write an expression (15)—$\alpha + \beta\ C + \gamma\ Si$ - - - etc., in which the symbols of the elements represent concentration in 0.01 per cent and the Greek letters represent constants to be computed from the data. Log a and b can be represented by such an expression, the constants depending on whether the steel is normalized and tempered or quenched and tempered, and differing for elongation and for reduction.

Using the foregoing data it is possible to plot a line such as that in Fig. 1, appropriate to a given composition. Let the caution be repeated that for various reasons the predictions regarding reduction of area may not be as dependable as those regarding tensile strength. To make such a line as is discussed above useful we must be able to say what part of its length (that is, what range of tensile strength) can be attained by variations of heat treatment.

The lowest strength which a steel can have is that corresponding to the condition tempered just below the critical point. It does not make much difference whether the metal was first normalized or quenched. The greatest strength in the normalized state is that without tempering, and that for the quenched and tempered state is that at the lowest tempering temperature, here 400° C (750° F). The first and last of these can be calculated from such an expression as (15) and the second can be calculated from a similar expression with the addition of another step. The corresponding constants are as shown in Table II. The relation of the number computed from the third column, which we may call "X", to tensile strength, involves a somewhat complex mathematical expression (16):

$$T = 12.28 + 5.17 \int_0^{0.20(X - 12.24)} e^{-\lambda^2}\, d\lambda$$

where T is the normalized tensile strength and λ is a variable of integration. It is easier to read the values of T for a given value of X from a graph, Fig. 8.

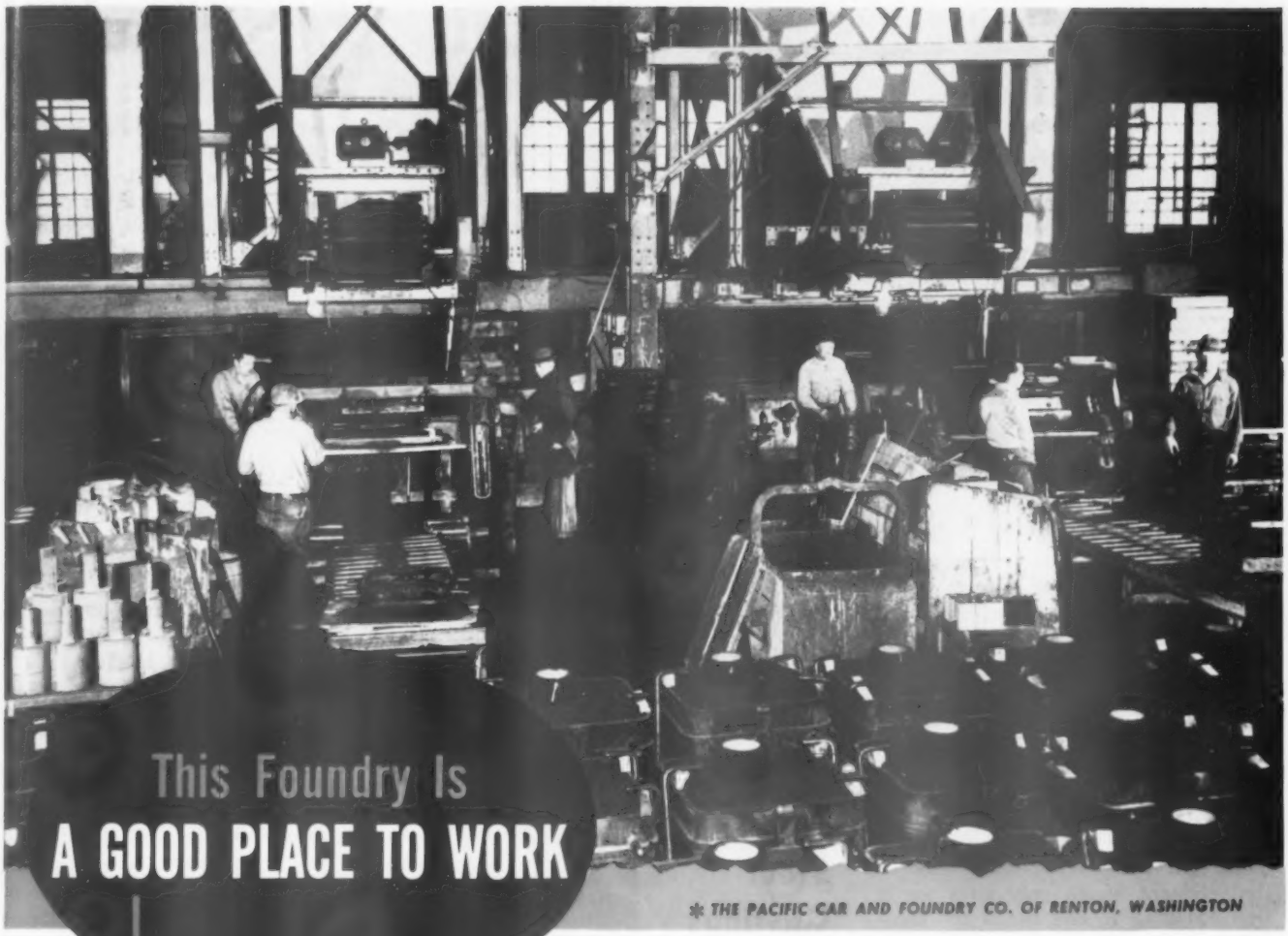
Strength Increases Rapidly

It is easy to see from Table II that the range of strength which can be secured from a quenched and tempered steel increases rapidly with alloy content. The negative value of the constant in the second column of the table apparently means that pure iron given this heat treatment has a negative strength. The constant, however, has no real physical meaning since pure iron given these heat treatments would not pass through the same microstructures, and hence is not a part of this universe. Even the constant in the first column is a little low for the strength of pure iron. A negative value from the last column does not necessarily represent a negative strength, owing to the effect of (16).

Even casual reading will have suggested to the mathematically minded reader that (2) and the data of Table I are consistent with (3) and (4) only if the coefficients of all the elements are in the same ratio in log a and b. Otherwise (3) and (4) would have contained terms involving chemical composition. It develops

(*Concluded on page* 186)

SENIOR CHEMISTRY STUDENTS of Jackson High School recently visited the Jackson Iron & Steel Co., Jackson, O. They heard a brief story on the manufacture of blast furnace silvery pig iron, explained by Wilfred H. White, metallurgist, then saw the furnace in operation, including a cast of the iron into pigs. At rear center in the photo is Kermit Daugherty, superintendent of Jackson schools, and at extreme right is E. Stanford Kearns, chemistry department head



This Foundry Is
A GOOD PLACE TO WORK

* THE PACIFIC CAR AND FOUNDRY CO. OF RENTON, WASHINGTON

THE Pacific Car and Foundry Company of Renton, Wash., is a name well known to Western heavy industry and to buyers of steel castings in many fields.

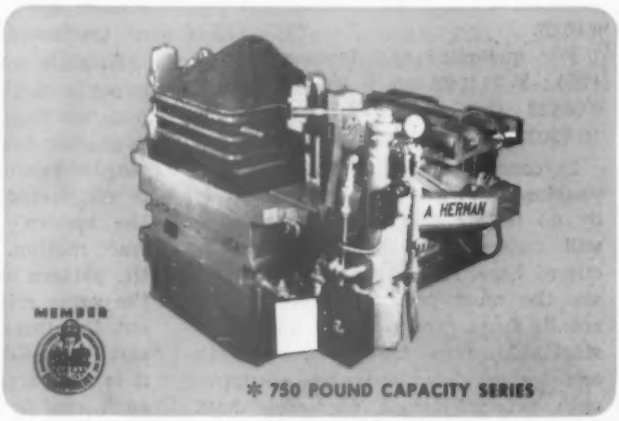
A steel, tile and glass building 210′ x 650′, modern air-conditioning and lighting, plus its safety and good housekeeping policies, make this foundry an orderly, healthful and safe place to work.

Equipment is also geared to modern foundry operations and includes two electric-arc melting furnaces with a combined capacity of 52 tons per shift, mechanical sand preparation and distributing machines, and the latest type core making and molding equipment.

Typical of this modern equipment is their battery of Herman Molding Machines—750 to 10,000-pound capacity—built by Herman for this foundry. For easy and safe operation of the Hermans, one rotary valve controls all operations; automatic air lock pattern draw leveling device equalizes irregularities in flask and bottom board; pressure lubrication to each moving part.

Herman Molding Machines in this great Western foundry are typical of the rugged machines used by foundries all over the world today. They have made their way by the way they're made.

We will be pleased to recommend molding machines suited to your particular operation, or give you more information about them.



* 750 POUND CAPACITY SERIES

Herman

* WRITE FOR OUR NEW ILLUSTRATED CATALOG

MOLDING MACHINES

HERMAN PNEUMATIC MACHINE CO., UNION BANK BUILDING, PITTSBURGH, PA.

(*Concluded from page* 184)

that (3) and (4) are only rather good first approximations, and study of other series of heats confirms the ideas that actually the relation of log a to b is to some extent dependent on composition. Omitting a lot of intervening arithmetic it is probable that the following are improvements in (3) and (4).

For normalized steels (17): $\log a = 1.80370 - 0.07050\ b - 0.00151\ Si - 0.00121\ Mo + 0.00164\ V$.

For quenched and tempered steels (18): $\log a = 1.52177 - 0.05239\ b - 0.00272\ C - 0.00047\ Si + 0.00043\ Cr - 0.00070\ Mo + 0.00107\ V$.

A steel having a high value of a (or log a) for a given value of b of course has a higher elongation at a given strength. From the above, silicon and molybdenum are objectionable and vanadium helpful in all cases. In quenched and tempered steel carbon is detrimental and chromium helpful. The reader is to be cautioned, however, that the substitution (17) and (18) for (3) and (4) will not produce any very erroneous effect. The differences are of a magnitude where it would take very numerous observations to verify them. Carbon in (18) is the most important element. An increase of 20 points in that element would only alter log a by 0.05440 or a, and hence the elongation at a given tensile strength, by about 10 per cent.

Statements Involve Composition

A similar chain of reasoning can be applied to yield strengths, which also conform pretty closely to the form of (2) as it should if (13) and (14) are valid. Better statements, involving composition, are:

For normalized steel (19): $Y = (0.8987 - 0.00259\ Mn + 0.00205\ Ni - 0.00732\ Mo)\ (T - 9.7479) + 6.6518$.

For quenched and tempered steel (20): $Y = (0.1400 + 0.00387\ Mn + 0.00823\ Cr + 0.0654\ V)\ (T - 10.7207) + 7.8658$.

In conclusion, let it be again emphasized that the author's thought is by no means that every heat made will conform to the relations discussed here. He says only that these are the most probable results. Test results from even a single heat have standard errors, and since our data are derived from averages of duplicate determinations for each heat treatment, our derived numerical results for each heat are seldom based on more than 20 or 25 observations. Further, there are, no doubt, unconsidered variables, particularly in the case of reduction of area. These represent the effect of sonims and of elements overlooked in analyses. Our present report does not include the effect of boron, titanium or aluminum, one or more of which are present in traces in most heats. It is the writer's hope that he has shown that the static tensile properties are so closely interrelated that it is not possible to produce any large variation in one without corresponding variations in all. The conclusion, though not surprising, perhaps even obvious, is often overlooked.

So many employees of National Malleable & Steel Castings Co. have helped in making these steels, preparing specimens, and making the thousands of tests and analyses, that individual acknowledgment is impracticable. Special thanks are due, however, to W. K. Bock, who supervised much of the work and did much testing, and to Jean McGlone and James V. Anthony for the months, even years, of computation involved.

Machine Molding Steel Castings

(*Continued from page* 81)

factorily compacted mold or core is secured. If the flask or box is deep, however, and especially if the piece being made contains narrow deep pockets into which the sand must be forced, a proper ram is very difficult to obtain merely by pressing down on the top of the sand. Consequently, plain squeeze molding machines seldom are used for ramming flasks or coreboxes over 5 or 6 in. deep.

In plain jolters, in which the ramming is carried out only by repeated jolts, as flour or other loose material is shaken down in a measure by rapping it against a table-top, the sand is compacted against the pattern by the sudden checking of its downward motion. As in using a squeezer, the pattern and flask must remain in the same relative positions throughout the ramming operation, and the sand moves downward in the flask as it is compacted. Because the sand at each level in the flask or box is compressed by the weight of the overlying layers, it is evident that at the very bottom it will be compacted the most, and that the degree of compactness will decrease steadily from the bottom upward.

The sand at the top of the flask can be compressed on a plain jolter only by heaping on more than is needed, and holding the excess in place with a removable wooden or metal frame, or by setting a heavy metal plate on it. The former method usually is preferred, since the extra sand can be struck off readily and that in the top of the flask made a little firmer by "butting it off," that is, by going over it with the butt end of a hand or air rammer. Even when this precaution is taken, however, the sand in deep flasks made on plain jolters is none too evenly rammed, especially against surfaces that are nearly vertical.

Sand Jolted and Squeezed

To compact the sand more uniformly in the flask, it is often first jolted, then pressed down at the top just as it is in plain squeezers. This is carried out on machines known as jolt-squeezers, in which the mold is first jolted until the sand next to the pattern is thoroughly compacted, and then given a final squeeze that compresses the sand in the top of the flask, and thus makes butting-off unnecessary. In flasks of moderate depth a jolt-squeezer rams the sand fairly evenly from top to bottom, but if a very deep flask is jolted and squeezed, there will be a layer of sand part way down that is less dense than that in either the top or the bottom of the mold. However, for a wide variety of work, the ramming is perfectly satisfactory and so much time is saved by the elimination of butting-off the copes that the squeezing feature adds greatly to the value of the machine. The difficulties of designing the mechanical features, however, have limited the application of jolt-squeezers to flasks not over some 4 feet in maximum dimensions, and on the largest machines only the jolting feature is employed.

At the time when molding machines were being developed, efforts were made to utilize the principle of compacting the sand in a flask by dropping it against the pattern from a suitable height, so that it would ram itself as the flask was filled. Today, many foundries, especially those making large work in deep flasks, use sandslingers, which compact the sand in the flasks or core boxes by an improvement on this method. These machines operate by hurling successive lots of sand, each about the size of a small handful, downward against the pattern or into the corebox. The throwing device operates so rapidly that the sand appears to be delivered in a steady stream, and is ejected into the flask

(*Continued on page* 188)

DUSTUBE *keeps costs down*

at the SUPERIOR STEEL & MALLEABLE CASTINGS CO.

BENTON HARBOR, MICHIGAN

ASSISTANT GENERAL MANAGER
Mr. L. D. Reiff

"Dustube—it's a big word in dust collection. Proved by heavy duty dependable service on our two biggest dust creating operations—sand mixing and blast cleaning. We have found them to be most economical and most dependable. They can't be beat for efficiency and they cost us just a few pennies a day to operate. The way they eliminated our dust problems convinced us that, 'It pays to own a Dustube'."

MASTER MECHANIC
Mr. Chester Jollay

"We save both hours and dollars in maintenance with the Dustube Dust Collectors. They have not required any service or repair other than simple lubrication and the occasional replacement of cloth tubes in their years of rugged service. Its simplicity of design appeals to our maintenance gang since thorough inspection is so easy and rapid—no other piece of equipment in our foundry has such a favorable record."

FOUNDRY FOREMAN
Mr. John Burger

"Year after year, under the heaviest dust conditions, the two Dustubes provide us with the highest ventilating efficiency. I have never had a complaint from our men of dusty conditions which is a vital factor in maintaining our good employee relations. The important advantages of the Dustube based on our experience have been high efficiency, minimum operating and maintenance costs and dependable, rugged service."

* The Superior Steel & Malleable Castings Company are producers of open hearth and electric steel castings weighing from one pound to 15 tons.

The best salesmen for the Dustube are its users. For every day, they see the tremendous effect Dustube-cleaned air has on workers and equipment alike. Many have been able to compare the Dustube with other types of dust collection equipment. They find the Dustube has better efficiency for a lower cost than any other method. Management and workers both report that "It pays to own a Dustube."

DUSTUBE ADVANTAGES

BETTER DUST REMOVAL—Simple, fast, thorough. Shortens cleaning time.

POWER SAVINGS—Lower resistance to air flow. Lower air velocities.

HIGH EFFICIENCY—Nearly 100% efficient by convincing tests.

EASE OF INSPECTION—Clean, safe, simple. No parts to remove.

DUSTUBE FILTERS—No abrading metal contact. Easy to ship, store and handle.

FILTER REPLACEMENT—Takes only a few seconds. Requires no tools.

Write today for complete information about the many advantages of Dustube collectors. Ask for Catalog 72.

American dustube
DUST COLLECTORS

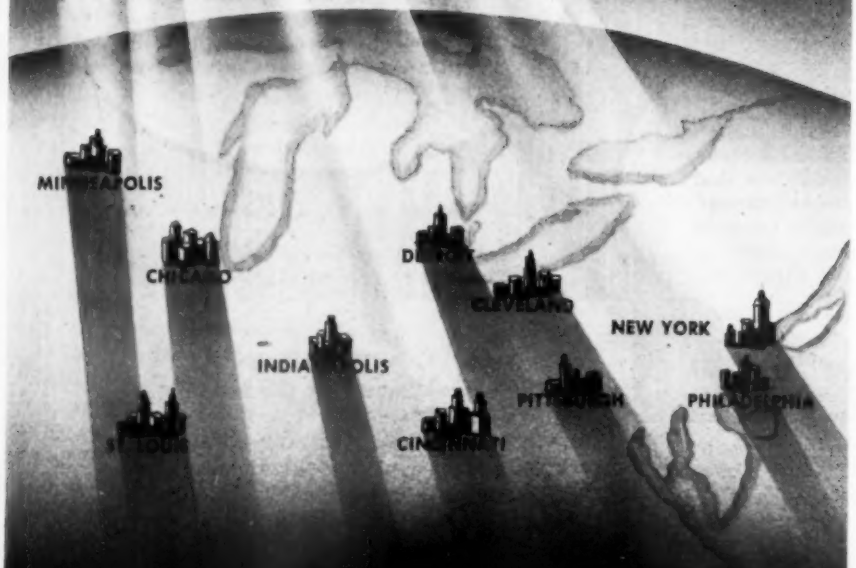
OFFICES IN PRINCIPAL CITIES

AMERICAN WHEELABRATOR & EQUIPMENT CORP. 505 S. Byrkit St. Mishawaka 2, Ind.

SERVICE NETWORK

- The ten offices that comprise the Hickman, Williams network are staffed by foundry commodity experts who are trained to give you efficient and helpful service.

For quick, intelligent action, contact the office nearest you.



Serving the metal industry with
FERRO PHOSPHOROUS ★ FLUORSPAR ★ SHOT
GRIT ★ PIG IRON ★ FLUORITE ★ COAL ★ COKE
SAND ★ CLAY ★ SILVERY IRON ★ FERRO ALLOY
BRIQUETS ★ SPIEGELEISEN ★ CLINKERED
DOLOMITE

Hickman, Williams & Co.

(INCORPORATED)

CHICAGO · DETROIT · CINCINNATI · ST. LOUIS · NEW YORK
CLEVELAND · PHILADELPHIA · PITTSBURGH · INDIANAPOLIS
Established 1890

(*Continued from page* 186)

or box at high enough velocity to compact it thoroughly. Naturally, instead of being tightest next to the pattern, as in jolting, or at the top as in squeezer operation, the sand is rammed by a slinger to an even density from top to bottom of the mold. For numerous applications, this feature is of sufficient importance to lead to the adoption of the slinger in preference to machines of other types.

"Squeeze" machines, which compact the sand by static pressure alone, may be either hand or power operated. Generally they consist of a table on which a core box, or a pattern board, pattern and flask are set, and a squeezer head that can be pressed down on top of the sand in order to compact it. In hand-operated machines, as shown in Fig. 4, the table is fixed and a lever and toggle joint force the moveable squeezer head down against the sand. In the larger squeezers, Fig. 2, a cylinder and piston operated by compressed air raise the table and flask and press the sand against the stationary squeezer head.

Limited in Steel Foundries

Hand-operated squeezers, while not as efficient as power-driven machines, are used as adjuncts to bench molding stands, to make up some of the small flasks and coreboxes ordinarily rammed by hand. Since it requires a great deal of power to compress the sand by squeezing alone in a large mold, even a shallow one, plain power squeezers are not used in steel foundry operation to handle flasks over some 20 x 24 in., and perhaps 6 in. in depth, or possibly somewhat over. They may be used to produce cores with one flat side, or to ram the sand in shallow drags and copes. If the latter are "barred," special squeezer heads are required which straddle the bars and compress the sand between them. However, as a rule, molds large enough to require barred copes are made on other types of machines.

With the small squeezers, it is possible to make up molds using loose patterns set on a flat board. Split patterns, one-piece patterns with a flat side which are molded entirely in the drag, patterns on follow boards, or even shell patterns, can be used, since a shallow cope can be squeeze-molded against a completed drag in much the same way as when molding by hand. Naturally, this practice only in part achieves the economies that can be secured with molding machines, and for large scale production the patterns are generally mounted on suitable equipment.

For this purpose as indicated in

Fig. 1, they are split into a cope half and a drag half, in the way that has been described for hand molding of larger castings. Instead of putting each half on its own board it is regular practice with small machines to use a double-faced matchplate with half the pattern mounted on each side. The same type of equipment, incidentally, in sizes up to perhaps 3 x 4 ft, is used on jolt squeezers. Each side of the plate is so shaped as to make a proper parting, like that formed when a loose pattern is set in a follow-board. These plates, therefore, somewhat resemble two-sided follow boards, with half patterns permanently attached to them. Depending upon the size of the casting to be made, one, two or a number of patterns are mounted on a single matchplate, with the necessary ingates in position. In most cases, also, pegs are provided on the cope side to locate and hold the riser and down-gate patterns.

Instead of using sheet metal or cast alloy flasks of the ordinary type, the smaller molds made on a squeezer and jolt-squeezer machines are usually rammed up in what are called strip or snap flasks, illustrated in Fig. 3. Molds made in equipment of this type are not left in the flasks in which they are rammed, but are removed from them after closing and set on boards. These molds thus differ basically from those that are left in the flasks and supported by them until they have been poured.

Flasks Tapered on Inside

Strip flasks are made with a pronounced taper on the inside so that they may readily be drawn off the sand. As neither drag nor cope is barred, the cope flasks are provided with what are called sand strips, to keep the sand from falling out when the copes are lifted and turned over. These are thin metal shelves, about ½ in. wide, around the inside of the lower edge of the flask as shown in Fig. 5. To allow the cope flask to be slipped off, after the cope has been set on the drag, the sand strips are quickly drawn from under the sand, by pressing a lever.

Snap flasks of one type are hinged at one corner, and fastened at the opposite corner by quick-opening clasps which are opened to take them off the mold. In another type, the hinges and clasps are replaced by special devices that enable the operator to more quickly open the flask and remove it from the completed mold. The better to retain the sand in the unbarred copes, snap flasks are only slightly tapered, and sometimes are corrugated or roughened on the

CENTRIFUGAL
R-C Centrifugal Blower, type OIB, in foundry service. Capacity 6,000 CFM, at 21 oz. pressure.
ROTARY
R-C Rotary Blower, type RCD, capacity 6,200 CFM.
1667
LET R-C dual-ability SETTLE THE QUESTION

If you are in doubt about whether Centrifugal or Rotary Positive units will do the best job of handling cupola air on any specific application, you can obtain an unbiased answer from R-C *dual-ability*.

Because we build both types, in wide ranges of sizes and designs, we can make sound comparisons and can recommend without prejudice the units whose capacities, pressures, drives and other characteristics deliver the best performance.

Only Roots-Connersville gives you this *dual choice*. It comes from 95 years of designing and building gas and air handling equipment, exclusively.

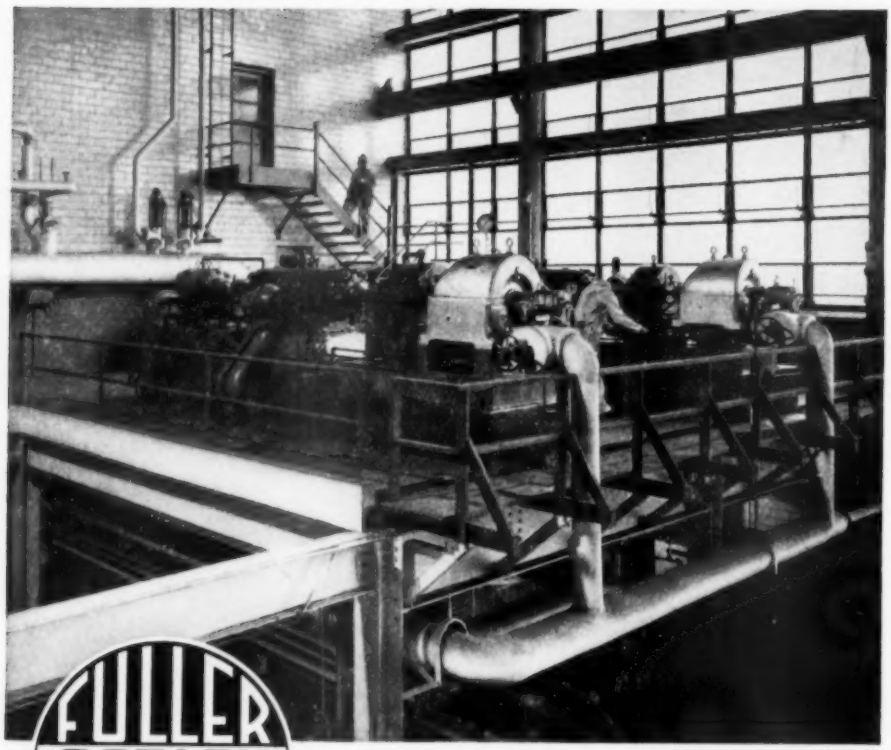
ROOTS-CONNERSVILLE BLOWER CORPORATION
907 Madison Avenue, Connersville, Indiana

ROOTS-CONNERSVILLE

BLOWER BUILDERS • R-C • SINCE 1854

BLOWERS • EXHAUSTERS • BOOSTERS • LIQUID AND VACUUM PUMPS • METERS • INERT GAS GENERATORS

★ ★ ONE OF THE DRESSER INDUSTRIES ★ ★



PHOTO—HEDRICH · BLESSING

FULLER ROTARY COMPRESSORS

in

SHERWIN-WILLIAMS

NEW BOILER HOUSE

Two Fuller Rotary Two-stage Compressors are installed in the new boiler house of The Sherwin-Williams Co., Chicago, shown above.

These compressors furnish air for both factory and power-house service. Each has a capacity of 1592 c.f.m., free-air, at 120-lb. pressure, driven by 350 hp. turbine, equipped with speed reducer, to operate at 575 r.p.m.

Fuller Rotaries are ideal units for any industrial plant. They are built in single and two-stage for capacities to 3300 c.f.m., actual free-air delivery, 125-lb. pressure; vacuums to 29.90-in. (referred to 30-in. barometer).

Bulletin C-5 illustrates and describes these machines. We will gladly send you a copy.

FULLER COMPANY

CATASAUQUA—PENNSYLVANIA

Chicago 3 - 120 So. LaSalle St.

San Francisco 4 - 420 Chancery Bldg.

C-180

A LIFETIME OF NEW MACHINE EFFICIENCY

FULLER

inside surface. In all flasks used for work of this type, guide pins set in the drag flask engage openings in the matchplate and in the cope flask, so as to hold the pattern in a fixed location with reference to the mold.

In making molds on a small squeezer, the cope flask is first placed on the table of the machine and the matchplate properly located by the guide pins, is set down on it. Then the drag flask is placed in position on the guide pins, filled full of sand and squeezed. Excess sand is struck off level and a bottom board, which as a rule fits inside the drag flask, is set on it. The whole assembly is rolled over by hand and placed back on the machine so that the cope flask is uppermost. The cope then is filled with sand and squeezed. Cope flask is removed and set aside, and the matchplate lifted off the drag. Any required cores are placed in position, the cope positioned on the drag by guide pins, the flasks are released from the molds, and the mold is picked up and set out on the floor or conveyor.

Openings In Squeeze Head

To clear the gate stick and the patterns that shape the sink heads, both of which extend through the sand of the cope, suitable openings in the squeezer head usually are provided. In some cases, however, especially when making comparatively small numbers of castings from a given pattern, spring-operated gate sticks are used, which move down with the squeeze head as shown in Figs. 6 and 7. These have the advantage of forming the conical top part of the downgate without the necessity of cutting the sand out with the trowel. Fixed gate sticks can also be made so as to form this conical top, but the sand usually has to be tucked around the top of such a stick by hand if it is to be tightly rammed. When a great many castings are to be made from a single pattern, the same thing may be done by mounting on the squeezer head the part that forms the conical top of the gate, leaving an opening in it through which a fixed stick, attached to the pattern plate, slides as shown in Fig. 8. This method, however, sometimes leads to trouble when improperly mounted, so that the stick fails to engage the hole.

When rammed up, the cope is lifted off the matchplate, as may be observed in Fig. 9, and the latter in turn raised from the drag. Guide pins ensure straight lifts, and vibrators on the matchplate serve to break the grip of the sand on the pattern. Cores, if any, are now placed, the

top of the down-gate smoothed off and enlarged to make a pouring cup unless the special mounting has been used, and the mold is closed.

In using strip or snap flasks, before the mold is set down where it is to be poured, as in Fig. 10, or on a conveyor, the flasks are removed, leaving the sand supported only by the bottom board. To hold the copes down when the molds are poured, weights so shaped as not to cover up the pouring cup and down-gate, may be set on them. As the fluid metal under pressure is apt to burst through the sand or at the joint between cope and drag, tight fitting wood or metal jackets or bands are slipped down over the molds before they are poured. These jackets and the top weights are generally shifted by men detailed for this work, from the molds just poured to those about to be filled with metal. Instead of using jackets, the molds are sometimes reinforced with bands of sheet metal, some 2 in. wide, which are set in the flasks before filling them with sand, and remain in place when the flasks are removed from tne molds.

Located By Guide Pins

Since the copes and drags of strip or snap flask molds are located with reference to each other by guide pins on the flasks, and the latter are removed after closing, these molds cannot be opened or inspected once they are set down. They are therefore usually poured "green," and require rather careful handling to prevent the copes from sliding on the drags and producing the mismatching of cope and drag known as a "shift." The pouring jackets cannot be relied upon to guard against shifts, as there are seldom enough jackets to take care of all the molds made up, and they are slipped over the molds only just before pouring off. In fact, if the jackets are not put on carefully, they may actually move the cope and drag, causing a shift.

Jackets preferably should be of metal, not wood, as metal ones are certain to fit the molds, and wooden ones may not. Some foundrymen even prefer that they should be of cast iron rather than of sheet metal, because rough handling will break a cast iron jacket and render it completely useless, while a sheet metal one may be bent and thus spoil a mold when a careless man tries to force it down on the sand. Jackets of an asbestos-cement, fireproof composition with reinforced metal corners also serve satisfactorily.

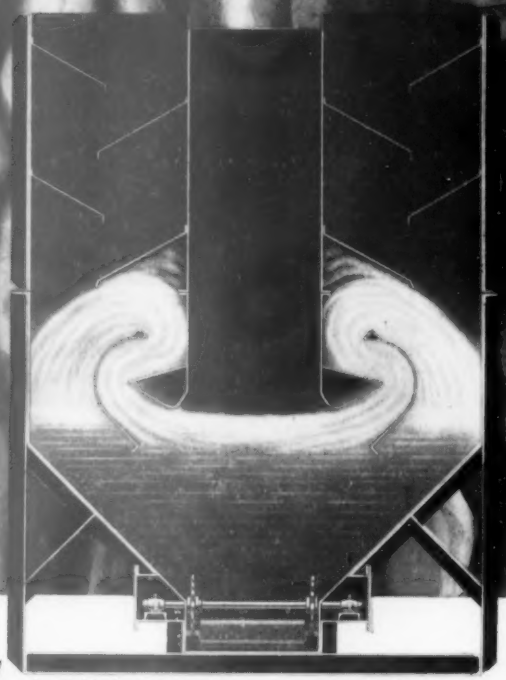
(To be continued next month)

Sources of Illustrations

Fig. 6—Federal Foundry Supply Co., Cleveland.

Fig. 9—Osborn Mfg. Co., Cleveland.

Modern Foundries Don't Have FUMES AND DUST



Available both as a floor-mounted type (shown) or an overhead installation. Complete with a motor-driven sludge removal conveyor, where required.

...they have Schmieg CENTRI-MERGE

AUTOMATIC ELIMINATION from Collection to Disposal

Operators of modern foundries have long since learned the economy of ridding their shops of destructive dust and smoke fumes. Men who work in foundries free of these health hazards feel better, work better, produce more. And the accident rate is lowered. In actual foundry operation, the Schmieg CENTRI-MERGE method of dust and fume elimination has shown marked advantages over any other system. Dust and fumes are collected *immediately they occur*—shot back on a stream of air through ducts to the Collection Unit. In the washing chamber of this unit—a veritable tornado of seething, churning water-dust is washed and scrubbed from the air and flooded into the sludge tank below, permanently trapped under water. Fumes go out the exhaust. AUTOMATIC operation from start to finish.

If you are interested in learning why the CENTRI-MERGE method is so highly endorsed by foundry owners and how its application can so greatly benefit your own operation, our engineers are prepared to give you some eye-opening information on dust and fume elimination—without obligation, of course.

THE best AIR PURGE is CENTRI-MERGE

Schmieg INDUSTRIES INC.
Engineers & Manufacturers

302 PIQUETTE AVENUE • DETROIT 2, MICHIGAN

By A. H. ALLEN
Detroit Editor
THE FOUNDRY

AROUND Detroit

Additional autobody die work in prospect, but miscellaneous gray iron business continues at slow pace. Crosley drops assembled stampings in favor of casting for engine block

AS IF mounting concern over the sad state of order books were not causing sufficient worry, eight large gray iron foundries in Detroit were slapped with a federal indictment early last month charging them with combining and conspiring to fix the price of gray iron and alloy castings. The companies are described as members of a local foundry organization whose total membership includes companies which account for some 75 per cent of the district's business in custom-built dies and fixtures, going principally to the automotive industry.

Some signs of improvement in the outlook for new cast iron autobody dies are sighted with the report that Chrysler engineers are busy reworking the lines of Chrysler, Dodge, DeSoto and Plymouth bodies, smoothing out some of the squareness apparent in the 1949 series. New roof dies, rear quarter panels and fenders are indicated and the program is of the rush variety, suggesting foundry work may be placed in the near term. Further possibility is seen of early body changes for Lincoln and Mercury. Designs for these models were frozen before the new Ford management took over in 1946 and they should come in for drastic refinement. The recommissioning of George Walker as consulting stylist on all Ford products as of June 1, after his earlier two-year contract had been allowed to expire last summer, is one hint that additional emphasis will be placed on Lincoln and Mercury styling.

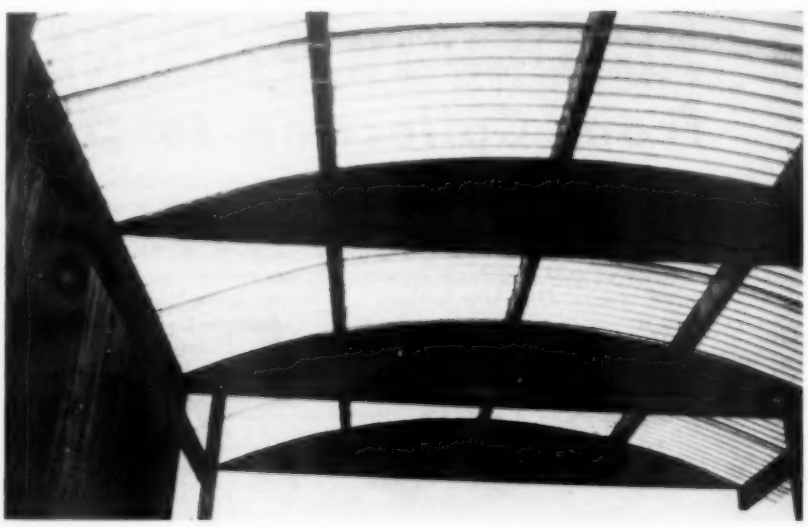
New body dies are going through the works for General Motors "C" series bodies for 1950, to be used by Cadillac, Olds and Buick. First of the new "B" body series will appear on the Buick special which goes into production late this month and will be previewed tentatively on Aug. 9. More head and leg room, completely redesigned grille and front bumper assembly, and relocation of "ventiports" from front fenders to hood sides are some of the expected changes.

Producers of smaller gray iron castings used in miscellaneous fields, including automotive, refrigeration, implement and machinery fields, find their volume of business off about 40 per cent from last year, necessitating extensive layoffs of plant personnel. Whether a pickup will develop this fall remains questionable. Union leaders, pressing for still higher wage rates, use the argument that improved fall business will justify a boost in rates, but they may wind up by finding their members enjoying higher wages—but no jobs.

The scramble for gray iron castings business is intense, and even some of the captive foundries of the

(*Continued on page* 194)

Translucent Sheeting In Roof Increases Plant Illumination



Allied Synthetics Co., San Diego, Calif., has developed a translucent corrugated sheeting made of Fiberglas mat impregnated with Laminac resin, which may be used for skylights or windows to provide natural illumination for almost any type plant. Corrugations correspond to those of standard corrugated metal, and the sheets can be installed in the same way. The material can be sawed and nailed with ordinary tools and punched or drilled for fastening in place with ordinary sheet metal screws or bolts. For weatherproofing lap joints, a special translucent mastic is available.

Weighing approximately 8 oz per square foot, the sheets are said not to shatter or rot, to be unaffected by climatic conditions, and to have sufficient strength to sustain weight imposed by a snowfall. As normally installed, the material will not readily ingite nor readily support combustion, it is claimed. With flat corrugation, the sheets are available in 8 to 10-ft lengths in 4-in. increments. Width is 26 in. Curved corrugated sheets in appropriate sizes for Quonset applications also are available.

The illustration shows how curved sheets are fastened to steel rafters to form a roof over the entrance to the mill building of National Tank Co., Tulsa, Okla.

FERRO-SILICON BRIQUETTES

Tepco Ferro-Silicon Briquettes, used mainly for the addition of silicon to the cupola charge of iron foundries, are most convenient because they contain a certain definite weight and can be counted instead of weighed. At the same time, the briquettes are more valuable than lump ferro-silicon because the binder in the briquettes protects the ferro-silicon as it is melted in the cupola and a greater return of silicon is obtained by that means.

Tepco Ferro-Silicon Briquettes are produced at our Chattanooga plant (formerly Southern Ferro-Alloys Company, Chattanooga, Tennessee). The 2½-pound briquettes contain one pound of silicon and the 5-pound briquettes contain two pounds of silicon.

Tepco Ferro-Silicon is also available in all sizes from lump through 150 mesh by down, packaged or in bulk—50%, 65% and 75% standard and low impurity grades. Special grades and sizes quoted on request.

PIG IRON

Diamond D Pig Iron—low-phosphorous, low-silicon, high-carbon, machine-cast—produced at our Wrigley Charcoal Plant at Wrigley, Tennessee.

Rockwood Pig Iron—malleable and foundry, machine cast, produced at our Rockwood, Tennessee, plant.

FOUNDRY COKE

Chattanooga By-Product Foundry Coke—produced from properly blended coals to furnish high-grade foundry coke. Widely used by foundries in the Southern area.

Chattanooga coke is also available in smaller sizes.

We will be glad to discuss with you, at any time, the numerous advantages of our plants and products.

TENNESSEE PRODUCTS & CHEMICAL CORPORATION

GENERAL OFFICES: NASHVILLE, TENNESSEE

PLANTS AT CHATTANOOGA, ROCKWOOD AND WRIGLEY, TENN.

Represented by

MILLER & CO., Chicago, St. Louis, Cincinnati; S. H. BELL CO., Pittsburgh; T. H. BENNERS & CO., Birmingham

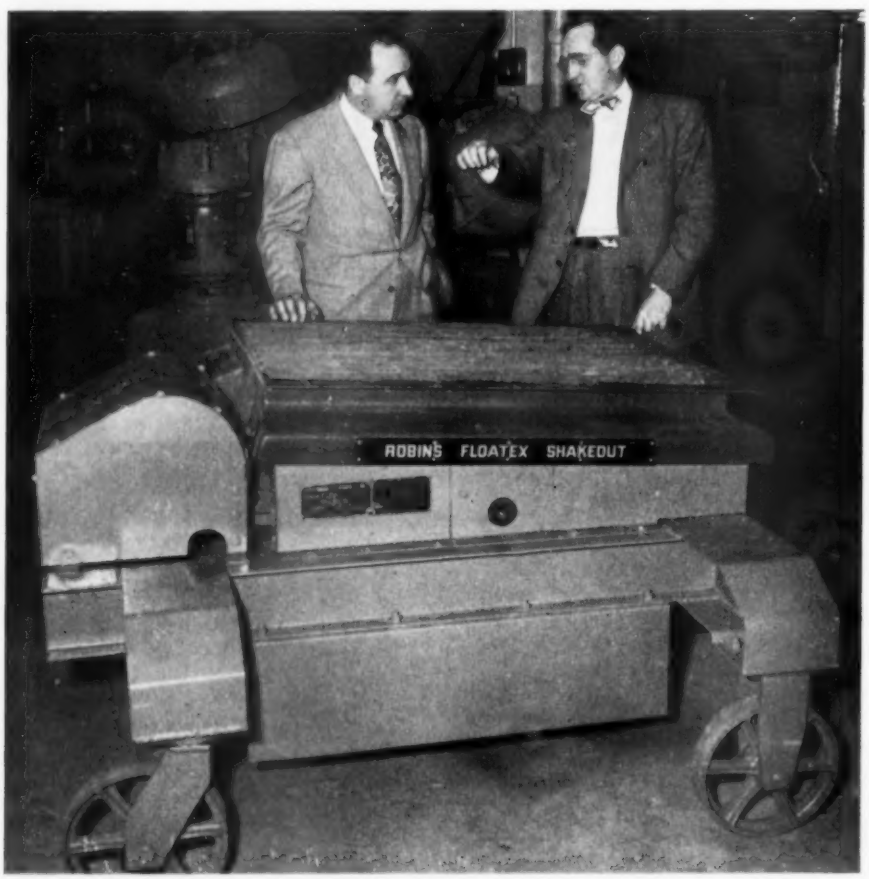
EXPORT AGENTS: ORE & FERRO CORPORATION, 30 Broad St., New York

(*Concluded from page* 192)
large automotive plants are soliciting business outside their own ranks. With their highly mechanized plants they can often come up with a price which competing independent melters find it difficult to meet.

The new Crosley line of small vehicles has made some changes of interest to the foundry field. In the first place, the former engine, built up of brazed steel stampings, has been changed to a cast iron block. The steel engine performed satisfactorily except that it developed excessive noise, a factor which many engineers felt from the start would prove troublesome. Damping characteristics of the cast iron block are a primary consideration in automotive engines.

A second change is the adoption of airplane-type hydraulic brakes, an adaptation of the Goodyear-Hawley aircraft brake now in use on private, commercial and military planes. Braking surface is a cast iron disk attached to the wheel. Instead of the conventional brake shoes, two friction "spots" are fixed on opposite sides of the disk and clamp against it when hydraulic pressure is applied through the foot pedal. Because the two "spots", faced with brake lining material, engage only a small part of the revolving disk surface at one time, the rest of the surface remains comparatively cool. Further, application of braking pressure on a disk instead of a drum is said to prevent the fading which often results from accumulation of water, dirt or oil in the drum. Such extraneous materials are claimed to be thrown off the disk by centrifugal force, while the friction pads, under pressure, wipe clean their path at each revolution of the wheel.

Production and jobbing foundries at the Ford Rouge plant lost no time in resuming operations following the 26-day strike which tied up operations during most of May. Maintenance crews had kept all equipment in readiness and no damage occurred during the shutdown which was entirely free from violence. Employees throughout the Ford system lost a minimum of 16½ working days, or aggregate wages totaling close to $18 million, while the company lost estimated production of 90,000 vehicles worth perhaps $100 million. There is no chance of either wages or production ever being regained. In the foundry departments, production loss figures to around 45,000 tons.



MIT: Floatex shakeout presented to Massachusetts Institute of Technology for its foundry laboratory by Hewitt-Robins Inc., New York, is a smaller version of a 100-ton foundry shakeout. The shakeout was presented as part of a program initiated by the Foundry Educational Foundation to interest young men in foundry work. Howard F. Taylor, right, assistant professor of metallurgy, accepts shakeout from Audie P. DeVita, left, product manager of foundry sales for Robins

OBITUARY

HOWARD C. REED, vice president in charge of manufacturing and engineering, Dunkirk Radiator Corp., Dunkirk, N. Y., died suddenly June 2. Mr. Reed was graduated in mechanical engineering from University of Michigan and had been associated with the boiler and radiator industry for 30 years. He had previously been associated as an engineer with the Continental Heater Corp. and National Radiator Corp.

* * *

Edward R. Young, 56, Chicago district manager, Climax Molybdenum Co., New York, died June 9. A graduate of University of Michigan, Mr. Young was associated with Detroit Steel Casting Co., Detroit, for 10 years prior to joining Climax Molybdenum in 1929 as metallurgical engineer. A member of the American Foundrymen's Society and the American Society for Testing Materials, he served on many of their technical committees.

* * *

J. Lewis Hay, 82, Little Silver, N. J., former president of the Hay Foundry & Iron Works, Newark, N. J., died May 27. Mr. Hay at 17 joined his father in the foundry business founded in 1830 by his grandfather. He succeeded to the presidency in 1919, and remained in that position until the business was sold in 1931 to the Bethlehem Steel Co.

* * *

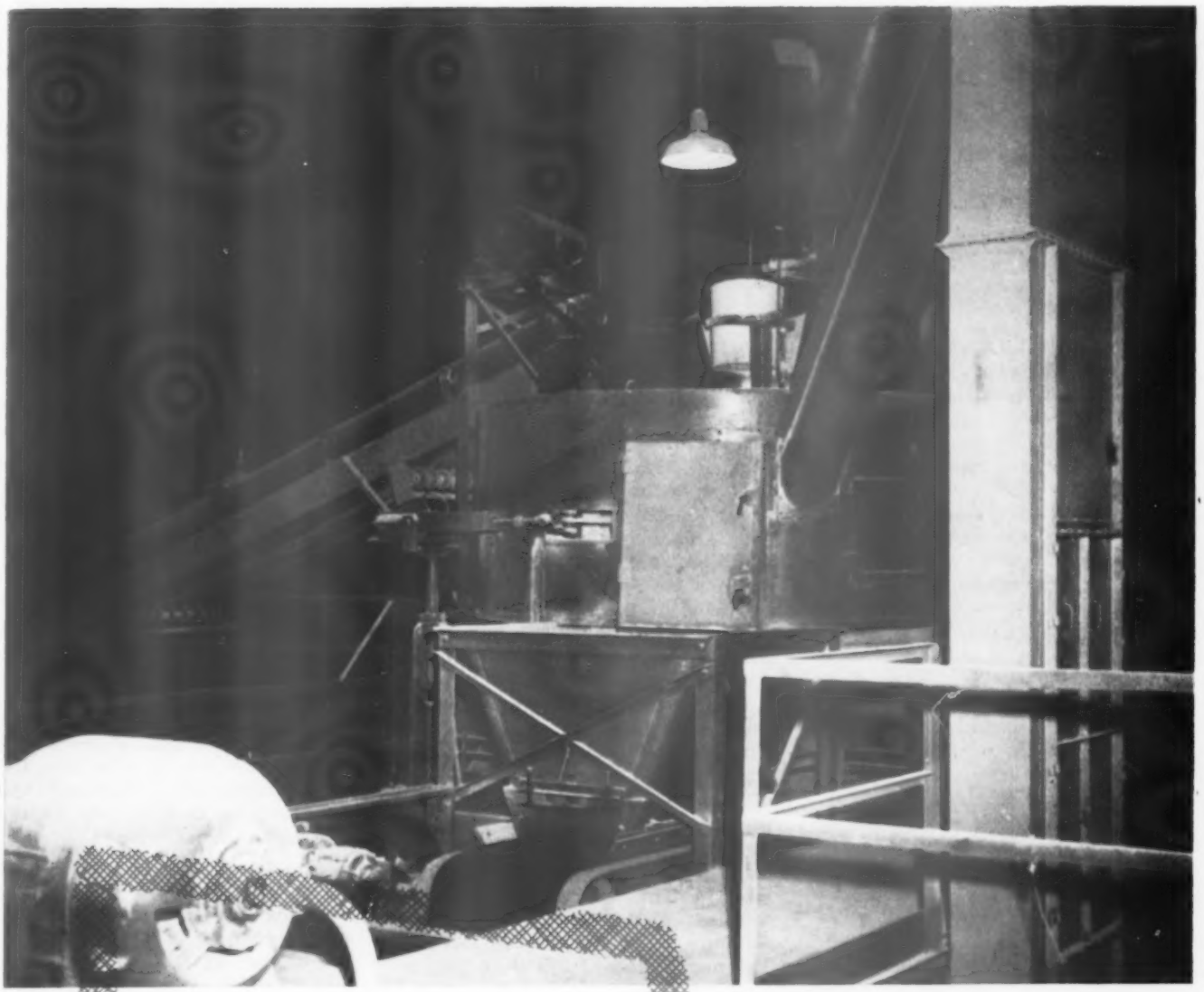
Oswald A. Biesel, 85, retired foundryman of Dallas, Tex., died at his home there May 24. Mr. Biesel was born in Germany and came to the United States in 1890. He went to Dallas in 1902 and worked for Sutton, Steele & Steele Inc. until 1935, when he retired.

* * *

William M. Greed, 44, president, Union City Mold & Die Casting Co., Union City, Ind., died Apr. 19. Mr. Greed, one of the founders of the company, had served as its president since its organization.

* * *

John T. McEnroe, 56, president and owner, John T. McEnroe Co., Chicago ferrous scrap brokerage firm, died May 23.



Pictured here is one of nine No. 920 Clearfield Mixers, all in one of the largest industrial plants in the East.

make your
continuous sand handling system
really efficient

with a

Clearfield Mixer

Clearfield Mixers perform perfectly in continuous sand handling systems. Their short mixing cycle, which can run as low as one minute, permits constant delivery of prepared sand either by the use of multiple mixing units or by the provision of storage bins preceding and following the mixers.

There's a Clearfield Mixer for every sand preparation need. Write today for Catalog No. 79 for complete details.

CLEARFIELD
MACHINE COMPANY
CLEARFIELD
PENNSYLVANIA, U.S.A.

By PAT DWYER

Drawings by RICHEY

ADVENTURES OF Bill

BILL appeared above the horizon the other day while I was soaking up some sunshine in an outdoor reclining chair. He seated himself in a somewhat similar chair, stretched his long legs, borrowed a match and a pipeful of my tobacco and sighed in a thoroughly contented manner. He smoked away in silence for several minutes, while I kept wondering when he was going to start one of his foundry monologs. Secretly I hoped he would make it brief. I was warm and comfortable and half asleep and the urge to either talk or listen was indeed very low. He knocked the ashes out of his pipe, pulled his pants up another six inches to display a pair of hairy shanks and, so far as I could see in my semiconscious condition, no socks. Noting my somewhat startled glance at the exhibition, he hastened to explain that he never wore socks in the summer time.

"I wore out a pair in St. Louis," he said, "racing around from one meeting place to another. With the uppers, the soles and heels and toes gone I shed the upper works. Habits of thrift and neatness acquired in my youth prevented me from leaving the souvenir relics in the hotel room. I wrapped them in a newspaper page which I no longer needed and threw them overboard at a spot somewhere between Terre Haute and Indianapolis. For several days I scanned the papers expecting to see a headline 'Local Sleuths Baffled By Pair of Feetless Socks With No Body In Or Near Them.' I trust that when and if they find 'em they will give 'em decent burial. Up to the present I have heard nothing.

"Well, sir, the great event of the year, the foundry convention is over. Several thousand men and a comfortable sprinkling of handsome ladies, toiling together and enjoying themselves, have scattered to all points of the compass. They have disappeared as completely as a flock of young quail when the hunter approaches the nest. I met all the old boys, and many of the up and coming, smart young lads. Taking it by and large, catty corner and down the middle 'twas a highly interesting, informative and enjoyable experience. The foundrymen of St. Louis gave a fine exhibition of their competence and the hospitality for which the city is noted.

"I had a slightly embarrassing experience one night when someone came knocking at my door."

"Just like Poe's raven, croaking 'Never more' two or three times."

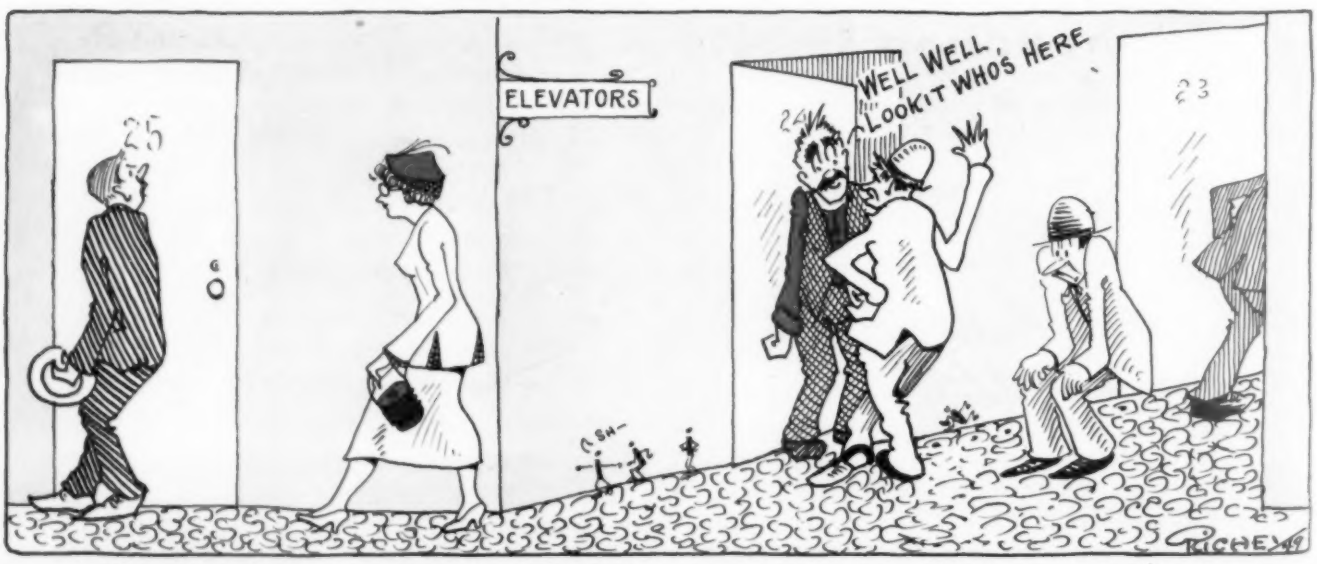
"And pray who the—what I mean to say, who is Poe? And where do you get this here now croaking raven? A popular belief in my younger days was to the effect that if you captured a raven, or any other kind of a crow, and split his tongue with a silver 6-penny bit, better known as a tanner, he could be taught to talk. I never saw an actual example. My brothers and I raised half a dozen tame crows every year. I was tempted many times to operate, but invariably was prevented by two important reasons (1) a horror of inflicting pain on any innocent creature and (2) I never had a tanner.

"I opened the door to admit an old gent, slightly bald, slightly bent and with a faint scent of the demon rum on his breath. With all the assurance and familiarity of an old friend he greeted me warmly.

"'Bill,' says he, 'you old crooked taran-toola, I certainly am glad to see you. You don't appear to have changed a bit since you and I worked for Jim Lanigan, the boy foreman in Lawrence.' Traces of the brogue which Jim brought from Ireland at the age of 2 always made him pronounce the name of his adopted town as La'rance.

"The old memory flared up and jumped over time and space, almost 50 years of one and nearly 1000 miles of the other. I could see my present visitor as he worked on the floor next to mine, a fresh-faced young fella with a head of curly hair and a rather imposing mustache. He bestowed a lot of attention on these more or less ornamental features. I can't speak from personal

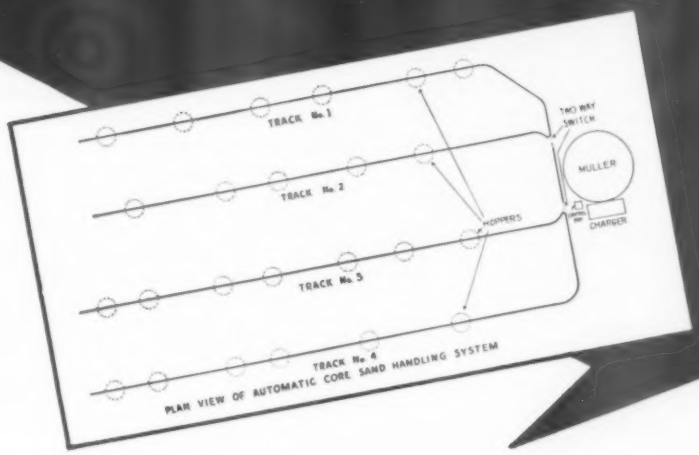
(*Continued on page* 198)



Left—Guest has trouble seeing what he is looking at. Right—All jolly good fellows around midnight

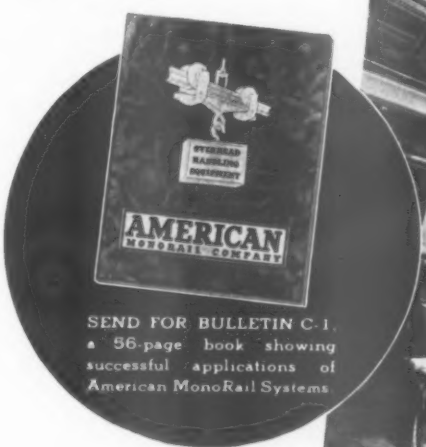
Automatic Dispatch System

delivers 25 tons of core sand per day!

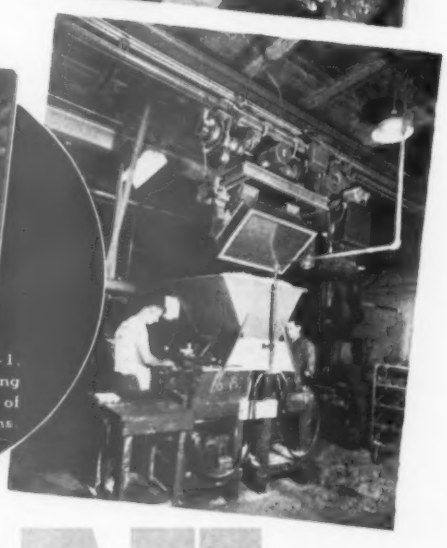


PLAN VIEW OF AUTOMATIC CORE SAND HANDLING SYSTEM

This compact system requires only two men to keep 24 core benches supplied with fresh core sand. Charger receives sand from underground conveyor. Sand is loaded and automatically dispatched and dumped to any one of 24 stations, on four tracks, by push button control. Track switches are manually operated. Each track can be increased to 16 stations or 64 in all. This is another of the hundreds of American MonoRail installations that have cut handling costs. Let an American MonoRail engineer show you how it can be done in your business.



SEND FOR BULLETIN C-1, a 56-page book showing successful applications of American MonoRail Systems



THE AMERICAN MONORAIL COMPANY

13104 ATHENS AVENUE **CLEVELAND 7, OHIO**

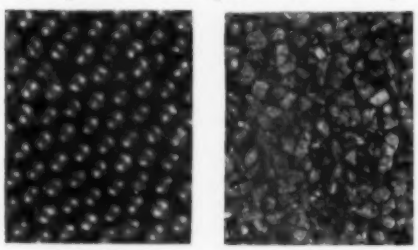
FOUNDRIES STRIKE "PAY DIRT"

This Amazing NEW SHOT and GRIT Pays Off BIG

20th CENTURY NORMALIZED

Copyright 1949

Have you ever seen greater uniformity?



U. S. Patent No. 2184926
U. S. Application No. 619602

It stress relieved. There is practically no shattering.

It lasts at least twice as long as ordinary abrasives, giving you greatly increased service from every ton you buy.

It is freer flowing. Our exclusive screening process insures greatest accuracy in shot and grit sizes.

It reduces equipment wear and maintenance at least 50% to 75%.

IMMEDIATE SHIPMENT

THE CLEVELAND METAL ABRASIVE CO.

Main Office and Plant: 887 East 67th Street, Cleveland 8, Ohio
Howell Works—Howell, Michigan

(*Continued from page* 196)

knowledge, since I never was present when he retired for the night, but it was a matter of common knowledge among members of the shop crew, that he anointed the hair every night with some kind of a repellant goo-gum. Before wiping his hands, he gently touched up the mustache.

"We had an elegant reminiscent session. Among other things, this doorknocker brought up the story of Snuffy McGoozlum, better known as the Penguin on account of the way he handles his big feet. He strolls into a shop one day presided over by a guy with a very tough reputation. When the Penguin braced him for a job, toughy takes a look up and down the shop and says he is not sure if he can put him on. Three of his men had been killed that morning, but they were only laborers. He told the lad to stick around for a while. A molder was bound to be killed or crippled during the day, and he could have the job. The Penguin did not wait. He told old Pickle Puss he would be right back. He had to go out and get a cup of coffee. Then he would return and make the sand fly. 'OK,' says the pusher, 'make it snappy. One of these (deleted by censor) birds is apt to get knocked out any minute.' The Penguin flew away and never came back.

"About midnight my chatty and old time friend flew away, and I have not seen or heard of him since. However, when I came back here a few weeks ago I had a letter from a man who craved a little information. Apparently he was a polite and friendly lad. In the first sentence he apologized for troubling me. The letter was typewritten, which left me at a loss to decide whether he was a young man on the threshhold of a career, or an older man merely moved by idle curiosity. If the letter had been written with pen and ink, I could have formed a mental picture of the writer, and ventured a fairly accurate guess on some outstanding characteristics. This letter was a one or two finger job. From the ragged appearance of the right hand margin, the lack of punctuation, and the original manner in which some of the words were spelled, I inferred that he was more familiar with the shovel and rammer than he was with the tools of the writer's trade. However, I had no trouble in understanding his message. For that matter I never had any difficulty in getting the full and exact meaning from crooked and hump-back messages scrawled on scraps of paper, by little chubby fingers."

"Better get out and throw the

switch. You are off the main line."

"Tis a common failing," Bill admitted. "Stand by and le's back 'er up."

"Better give 'er a touch of the sand. Your drivers are slipping."

"Toot-toot me boy. Kindly step to one side and le's go.

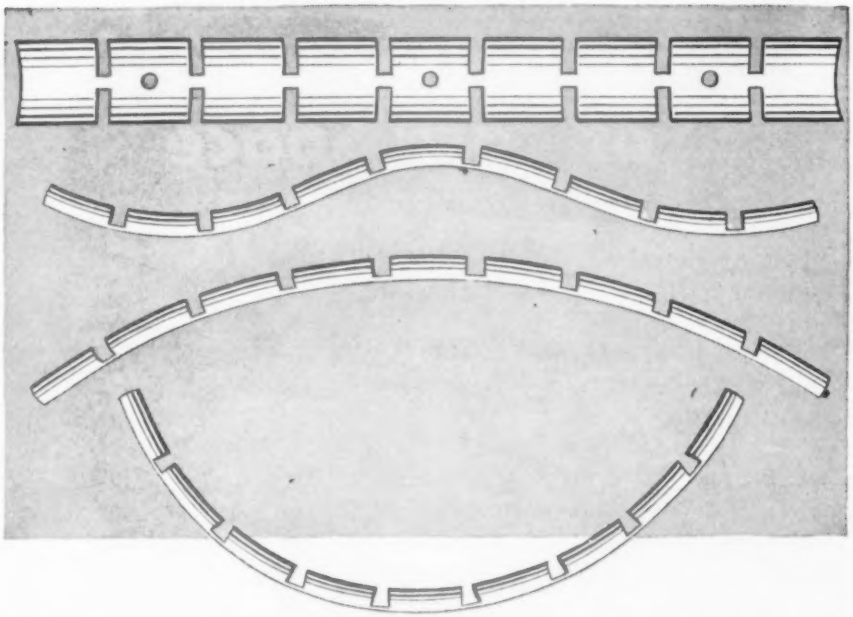
"This lad I was telling you about explained that at one of the noon-hour discussions, Old Tommy the loam molder inquired if any person knew the proper distance between fan or blower and the cupola. Long Jim from the dog house claimed the distance was not an important factor. The cupola man claimed it was a very important factor. 'Look at our own installation,' he said, 'with the

Modern version of Poe's never more

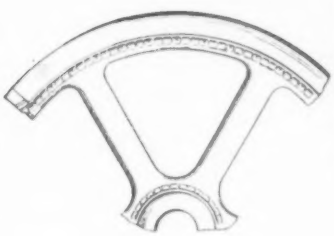
fan half a mile away. If it was as close as it should be, I could knock another ton per hour out of the old kettle.'

"That was one of his pet grievances. 'It stands to reason,' he claimed, 'that in a long pipe the pressure, velocity and volume of blast are dissipated to a criminal extent.'

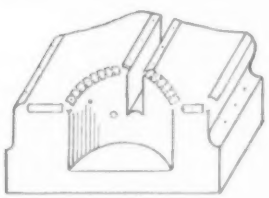
"The inquiry carried me back through time and space to the old-fashioned foundry in which I had served my time. The hand-operated jib cranes with a heavy load caused the roof beams to swing and sway in an alarming manner. The old shop was abandoned shortly after I left to seek my fortune in a wider field. The field was a little wider than I anticipated. I never quite managed to reach the magical land where, according to my old uncle Malachi, nobody worked, where swallows built their nests in old men's beards and live pigs ran up and down the street, with knives and forks stuck in their



Take the CURVES in HIGH with MILWAUKEE (PATENTED) Adjustable Radius Chills



Adjustable Radius Chills used to chill rim-and-web and hub-and-web fillets in a gear casting.



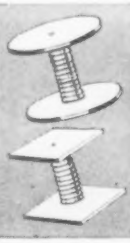
Adjustable Radius Chills in a semi-circular fillet, in 2 sections.

Curved or irregularly shaped fillets hold no fears for foundrymen who have learned how to use these easily adjustable, extremely flexible radius chills to gain one or more of these advantages:

- Quick, easy, hand shaping to fit single or compound curves along the fillets of cores or molds for cylindrical, round or irregularly shaped castings.
- Effective chilling of hub-and-web and rim-and-web fillets of gears and gear blanks.
- Eliminate buckling . . . because the rows of evenly spaced slots provide "room for expansion" when the hot metal contacts the chill.
- Adjustable Radius Chills are easily broken at 1" intervals to accommodate curved or irregular fillets of any length.
- They effect substantial savings in welding and cleaning costs.

Send for Samples and see for yourself that MILWAUKEE Adjustable Radius Chills can bring you these benefits, and more.

MILWAUKEE CHAPLET & MFG. CO.
1025 S. 40th STREET, MILWAUKEE 4, WISCONSIN



MILWAUKEE CHAPLET

A 5355-B

For Better Use of Yard Space

NORTHERN MAGNET HANDLING, ELECTRIC OVERHEAD TRAVELING CRANES

Higher Speed You can handle more turnover in a given space, or a fixed turnover in less space, with a Northern Electric Overhead Traveling Crane. Desired higher operating speeds are available through various combinations of bridge, trolley, and hoist travel speeds.

Dependability You can make most advantageous use of yard space without fear of crane breakdowns. Yard cranes are purposely built and equipped for rugged, 24-hour continuous service. They have only the heaviest duty type bearings, gears, end trucks, highest quality motors, controls, and other electrical equipment.

Visibility Safer, better, faster load handling and stacking is possible because the operator has better visibility from the Northern Clear Vision Control Cab.

Low Cost Operation Northern Magnet Handling, Electric Overhead Traveling Cranes cost less to operate—have oil bath lubrication which eliminates necessity for daily lubrication and crane idle time—have fewer parts to wear out, fail, or replace.

When you investigate, ask for Bulletin No. 141-C.

OVERHEAD ★ ELECTRIC CRANES ★ AND HOISTS ★

NORTHERN ENGINEERING WORKS

2615 Atwater St., Detroit 7, Mich.

backs, and all the while crying 'come on. Who'll ate me. Who'll ate me.'

"Before the old shop was abandoned, an up-to-date shop was erected close by. It was equipped with a traveling crane over the main bay, and with motors on the fans serving the two cupolas. The fans were situated on the charging platform a short distance from the cupolas.

"In the old plant in my time, also before and after, the fan was set up in the machine shop so that it might be driven by a belt from a line shaft. No motors in those days. The foundry was about 60 or 70 ft away from the machine shop. I never measured the distance, and what difference does it make? The little detail is neither here nor there. A long pipe under the ground carried the blast from the fan to the cupola.

"I cannot give you the size of the cupola or any of the details of operation, for the very simple reason that I did not think that melting the metal was included in the scope of my duties. In later years I discovered that this was the common attitude of apprentices and journeymen molders and coremakers. The idea never occurred to me that some day I might need that kind of knowledge. Youth has many advantages over old age, but most certainly—with maybe a few exceptions—the ability, or even the desire, to peer into the future is not one of them. The situation is summed up neatly in the well known quotation, which by no means is confined to the foundry, 'Come day, go day. God send Sunday.' I am glad to see in recent years, in shops where courses of instruction have been established, that apprentices are taught a great many things, that the making of a mold, important in itself, is only one of the steps in the long sequence of operations involved in the production of castings. This all-around proficiency is positively essential for those whose ambition points to any kind of supervisory position.

"However, what I started to say was that the iron melted in the old shop was as hot and fluid as any I have seen any place in recent years. I did not realize it at the time, but I know now that the autocratic cupola man was a highly competent and skillful performer. He had learned his trade in a car wheel shop. He was not a chemist or metallurgist in the modern sense, but he could break a pig and decide by the fracture whether it was, or was not, suitable for a certain casting.

"Even in my butterfly career, I was moved at times to wonder mildly

how he could produce soft and hard iron from the same heat. Soft iron for the ordinary run of work, and hard iron, also known as white iron, for the stamp shoes which crushed the gold quartz in big box-like castings, for some unknown reason known as mortar boxes. I never looked it up, but presumably the name was applied by some person who had seen a druggist pounding or grinding something in a device known as a mortar and pestle. The mortar is a pot or bowl made from some strong material and the pestle is the tool held by the druggist. In the gold quartz crushing mortar boxes, the shoes, usually five in number, were attached to vertical shafts actuated by cams. The cams lifted the shoes a certain distance, then passed from underneath and the shoes fell by gravity. A stream of water carried the crushed material over a mercury-treated riffle table which retained the gold particles and discharged the other material over the end."

"I hope," I said, "you did not include all this miscellaneous—ah, dope—in your reply to this undoubtedly honest lad who asked you a plain, civil question about short and long blast pipes connecting the blower with the cupola."

"Well," said Bill, "I'll tell you. When I ask a man a question, I don't like to be answered with a grunt or a brief yes or no. If he wants to favor me with a few general observations, why, that is all to the good. Also it fits in nicely with the good old Golden Rule: Do unto others as you would have others do unto you.

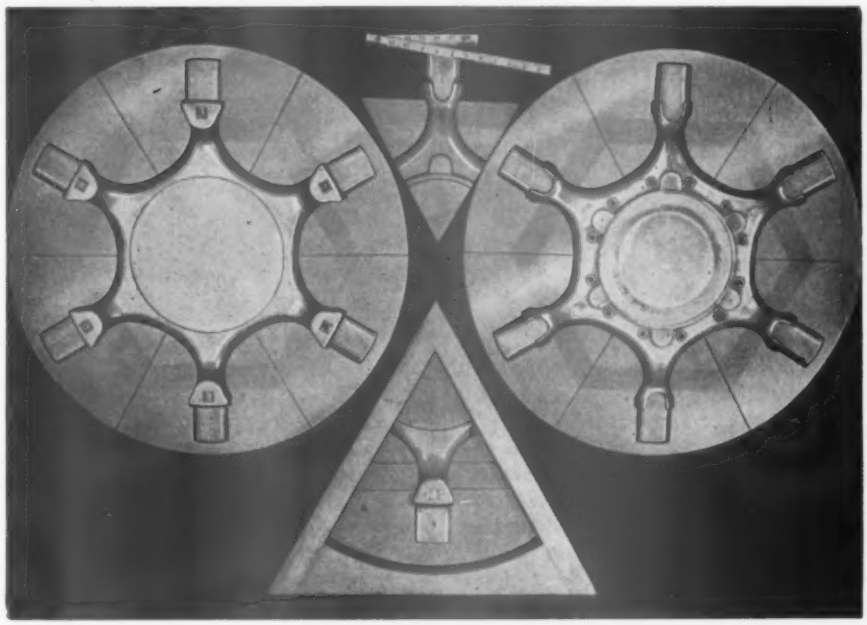
"Talking about questions and answers and all that kind of stuff reminds me of a jolly bit of a wheeze I read one time in a certain foreign publication. A young man entered a music store and asked for half a dozen *E* strings for a violin. The young lady attendant placed a box full in front of him. 'There they are,' she said, 'you'll have to pick 'em out yourself. I ain't been here very long and I can't tell the 'es from the shees!' "

"Did you include that gem in your reply?"

"Well, no. Enough is enough, and then he may have heard it before. Good day."

Black & Decker Mfg. Co., Towson, Md., has moved its Indianapolis service station to a new building at 1125 West Sixteenth St., Indianapolis. The branch is in charge of J. T. Redmon, service engineer, and M. D. Mooers, sales engineer.

PROFIT BY OUR MANY YEARS OF EXPERIENCE

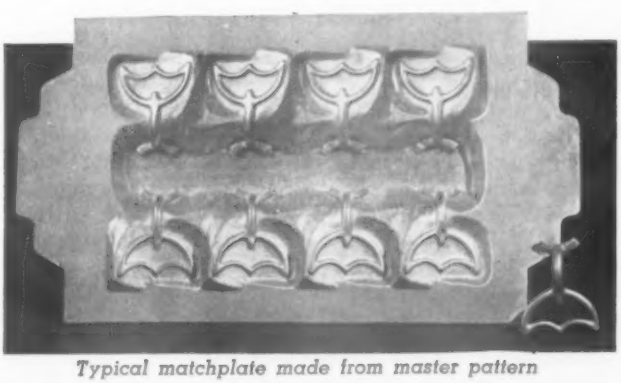


Cope and drag equipment for truck wheel, made from one spoke (1/6) of wheel.

Where Production is the First Consideration

Pressure Cast Aluminum Matchplates and Cope and Drag Plates are the Only Satisfactory Answer

Only one master pattern does it! From it we make you single or multiple pattern matchplates, casting them under pressure in plaster molds. Why not find out exactly how much we can save you by this method, or by furnishing cope and drag plates which likewise jump production and lower your costs? Write us for quotations now.



Typical matchplate made from master pattern

TOLEDO MATCHPLATE COMPANY

534 State Street — Toledo 2, Ohio

Affiliate—Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3, Ohio

Pressure-Cast MATCHPLATES
COPE and DRAG PLATES

INDUSTRY Briefs

BLAW-KNOX Co., 2028 Farmers Bank Bldg., Pittsburgh 22, will spend $1,500,000 in modernizing three of its foundry plants, namely: Lewis Foundry & Machine Division, Union Steel Castings Division and Pittsburgh Rolls Division, all in the Pittsburgh area. The purchase of some additional property as well as additional equipment at all three plants is included in the program. During the modernization period, which will take from nine to twelve months, there will be no stoppage in production.

* * *

Automatic Transportation Co., 149 West 87th St., Chicago, has opened a factory branch sales office and a service station and parts depot in New York, both under the direction of Philip E. Whiting. The sales office at 347 Madison Ave., is managed by D. D. Kirkpatrick and Robert O. Divine manages the depot, located at 1749 York Ave. Export headquarters, under the direction of J. Kazimirski, have been moved into the new sales office from 55 West 42nd St.

* * *

Harnischfeger Corp., 4400 West National Ave., Milwaukee 14, has completed construction of a new, modern warehouse and office building, at the corner of Huyler and North streets, Teterboro, N. J. The new building, of a permanent masonry type, with office projection finished in face brick, provides over 14,000 sq ft of floor space for equipment and facilities. It will enable Harnischfeger Corp. to enlarge its service to customers throughout the eastern area.

* * *

Vacuum Casting Corp., Philadelphia, has been formed to develop and license a new process for refining and casting metals in vacuum. Frederic O. Hess, president, Selas Corp. of America, Philadelphia, is president of the new company. Rawson L. Wood, president, Arwood Precision Casting Corp., Brooklyn, N. Y., is treasurer and E. Wellford Mason, secretary. On the board of directors are Dr. Tristan W. Metcalf, president, Long Island University, and M. F. Wendt. Davidlee Von Ludwig, Brooklyn, inventer of the process, is director of research for the new company.

* * *

Koppers Co. Inc., Koppers Bldg., Pittsburgh 19, has acquired the Freyn Engineering Co., Chicago, designer and constructor of blast and open-hearth furnaces and other steel mill facilities. The Freyn company will continue under its present name and personnel but will be operated at present as a wholly-owned Koppers subsidiary. Koppers now designs and builds coke and chemical plants.

* * *

Great Lakes Carbon Corp., Pine Ave. at 58th St., Niagara Falls, N. Y., will increase its electrode production this summer when it begins commercial operations at its Morganton Works, Morganton, N. C. The plant, consisting of 25 buildings covering half of a 44 acre tract, previously had been used by the Atomic Energy Commission.

* * *

R. K. Price Associates Inc., 70 Pine St., New York, has been appointed export sales representative for the C. O. Bartlett & Snow Co., Cleveland. The export organization will handle the foreign sales of the Bartlett & Snow company's foundry sand, mold and castings handling equipment, sand dryers, sprue mills, dust collectors and ventilating hoods.

* * *

Core Steel Equipment Co., 195 Front St., Brooklyn, N. Y., manufacturer of steel office equipment, has bought the former York Safe & Lock Co. plant, containing 330,000 sq ft, at York Pa. The York plant will be operated in addition to the plant in Brooklyn with the foundry to be used to make hardware for office equipment.

* * *

Whiting Corp., Harvey, Ill., has opened a Pacific coast office and plant at 5649 Alhambra Ave., Los Angeles. Allen R. Binckes is district sales manager and J. A. Handley plant superintendent. New distributors announced by the company are: George E. Miller Co., 24 Brighton Ave., Boston 34; Grays Metal Works, Inc., 56th St. & Grays Ave., Philadelphia 43; and James J. Burke Co., 405 Kearns Bldg., Salt Lake City 1, Utah.

* * *

Plant No. 1 of the Unitcast Corp., Front St. & Millard Ave., Toledo, O., suffered $50,000 damage in a recent fire in its heat treating, layout inspection and straightening operations department. Operations were transferred to plant No. 3, 1414 East Broadway, Toledo, while repairs were made.

* * *

Air Reduction Co., 60 East 42nd St., New York 17, manufacturer of industrial gases and welding equipment, has opened a new oxygen plant in Flint, Mich. The plant also will be an acetylene gas supply point and a store room for welding equipment and supplies. Leo Vansaw is plant superintendent.

* * *

Atlas Imperial Diesel Engine Co., 1000 Nineteenth Ave., Oakland 6, Calif., controlled by the Bank of America, recently acquired the manufacturing assets of Lorimer Diesel Engine Co., Oakland, which will operate as a division of Atlas under the direction of Ralph S. Lorimer, former head of the newly acquired company.

* * *

Minnesota Mining & Mfg. Co., St. Paul, will open a 65,000 sq ft converting plant for coated abrasives at Cumberland, Wis. The plant will be built by the city of Cumberland and leased to the manufacturing concern, which plans to begin operations by Dec. 1.

* * *

Western Foundry Co., P.O. Box 878, Tyler, Tex., is constructing a new building of 30,000 sq ft in which cast iron soil pipe and fittings will be manufactured. Previous operations had been confined to castings for stove, heater and agricultural equipment.

* * *

Baker Industrial Truck Division, Baker-Raulang Co., has moved its general offices, including the purchasing, sales, engineering and service departments, to 1250 West 80th St., Cleveland 2. Manufacturing operations at 2168 West 25th St., will be moved to the new location soon.

* * *

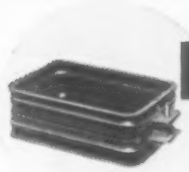
Lake Shore Engineering Co., Iron Mountain, Mich., has formed a Conveyor Division to manufacture and

(*Concluded on page* 204)

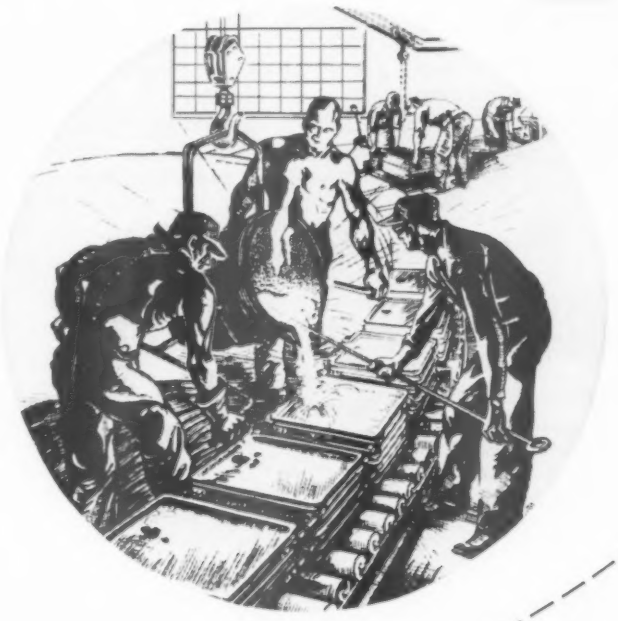
Truscon has the

technical service

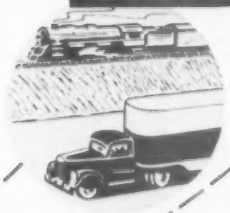
design



steel materials



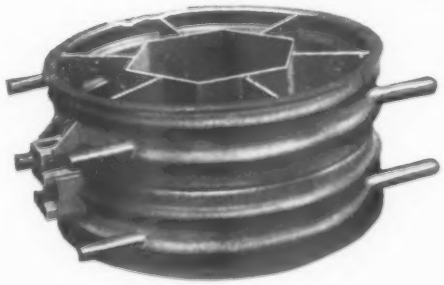
deliveries



you need in foundry flasks

Above:
Model TM-10
two man flask

Below:
Model TM-60
two man round flask



. . . and they all add up to *better production* for you!

Better production because Truscon Steel Flasks are efficient . . . are made to fit specific, individual foundry jobs.

Better production because Truscon Steel Flasks assure *continuous* production! They're made strong where strength is needed...made of rugged heavy gauge steel that wears as only steel can wear...month after month, year in, year out!

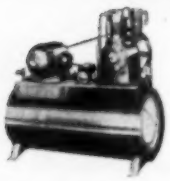
Truscon's prompt delivery service helps foundry production, too, because Truscon gets the flasks you need *where* you want them *when* you want them. Truscon men will be glad to work with you and for you to help select the right flasks for *your* particular jobs.

Send for Truscon's catalog complete with specifications and details on Truscon Steel Foundry Flasks.

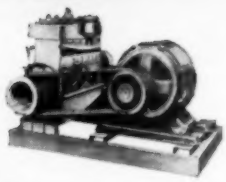
TRUSCON STEEL COMPANY
PRESSED STEEL DIVISION
6100 TRUSCON AVENUE • CLEVELAND 4, OHIO
SUBSIDIARY OF REPUBLIC STEEL CORPORATION

CHOOSE THE COMBINATION SUITABLE FOR THE JOB!

There's a Schramm Size for every Requirement

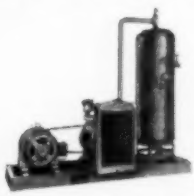


SMALL INDUSTRIAL COMPRESSORS... from ¾ to 5 H.P. single or two stage with horizontal or vertical tanks, working pressures, single stage up to 150 pounds and two stage up to 200 pounds pressure.



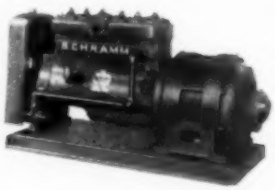
"V" BELT DRIVE ON BASE WITH MOTOR ... this type assembly has proved very popular because it permits the use of the most advantageous operating speeds where only odd frequencies and voltages are available.

MODEL 50 "BUILT-IN" MOTOR DRIVE... the overhead tank unit is only one of the many models and combinations of this small compact industrial compressor that can be bolted direct to any substantial floor.

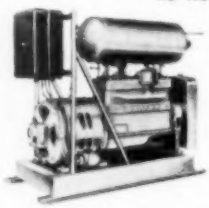


COMPLETE WITH VERTICAL TANK AND COOLING UNIT... a package that simplifies installation. Compressor is mounted complete with motor, vertical tank and cooling unit on base that can be bolted to any solid foundation.

HEAVY DUTY "V" BELT DRIVE... built in sizes ranging from 157 to 609 cubic feet displacement, suitable for service twenty-four hours per day with the lowest up-keep and operating costs.



DIRECT MOTOR DRIVE WITH COOLING UNIT... the built-in type utilizes to the fullest extent the efficiency of motor and compressor. No external flywheels or pulleys, no vibration and no bolts to adjust.



OVERHEAD TANK, STARTER AND COOLING UNIT... the advantages of this type of installation are, the absence of any external parts, no belts to be maintained, or to be replaced when worn out, small floor space required. This unit is practically vibrationless in operation, and can be placed and operated on any floor of sufficient strength to carry the load, no foundation is required.

WRITE FOR BULLETIN 4810

SCHRAMM INC.

THE COMPRESSOR PEOPLE • WEST CHESTER • PA.

(*Concluded from page 202*)

sell lightweight, power-driven, portable belt conveyors for handling bulk and packaged materials. The machines formerly were manufactured by Material Movement Industries Inc., Skokie, Ill., which has been dissolved and its president, Horton Conrad, appointed to direct sales of the new Conveyor Division.

* * *

Woodland Foundry Inc., Woodland, Wis., has been formed to operate a brass and iron foundry. Capital stock of 1000 shares of common at a par value of $100 per share has been authorized; minimum capital to be $70,000. Incorporators are Olaf Bie, John Smith and Bernice Schroeder.

* * *

American Emery Wheel Works, Providence, R. I., manufacturer of abrasives, has appointed Allmon Products Division, Allmon Steel Co., Arrott Bldg., Pittsburgh, as exclusive representative in western Pennsylvania, West Va. and eastern Ohio.

* * *

Victor X-Ray Corp. of Canada, Ltd., has changed its name to General Electric X-Ray Corp. Ltd., paralleling the name of its United States affiliate, according to E. W. Hollingum, manager of the Canadian firm located at Montreal, Que.

* * *

Combined volume of shipments of ingot brass and bronze, as reported by the Ingot Brass & Bronze Industry, Chicago, was 10,695 tons for April, 1949, compared with 14,550 tons for March and 35,177 tons for April, 1948.

* * *

Gustafson Foundry, Corpus Christi, Tex., has been granted a 50-year charter of incorporation. Incorporators are Carolyn Elaine, Elsie Elnora and A. W. Gustafson. Authorized capital stock was listed at $5000.

* * *

Williams Bros. Inc., 1125 W. Beardsley Ave., Elkhart, Ind., has built an addition to its brass and aluminum foundry and has installed sand mulling equipment.

* * *

MacMen Inc., 3440 East 22nd St., Los Angeles, has been organized to operate throughout the western states in machinery setting and industrial piping for any type of plant.

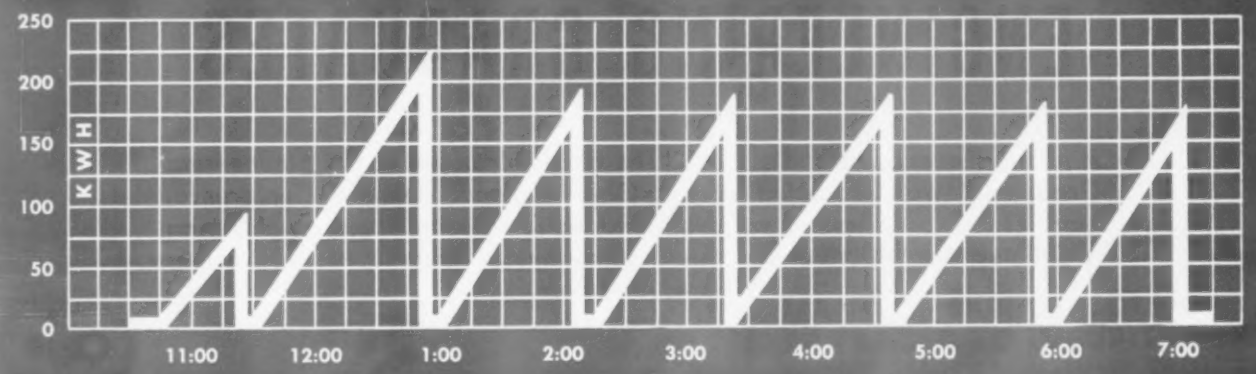
* * *

National Metal Abrasive Co. has introduced a new shot and grit, known as Permabrasive. The material is being sold through the ten offices of Hickman, Williams & Co.

* * *

American Colloid Co., has moved its general offices from 363 West Superior St., Chicago 10, to Merchandise Mart Plaza, Chicago 54.

DETROIT ROCKING ELECTRIC FURNACE



One month's operation of type LFY, 175 KW, 700 lb. nominal cold charge capacity Detroit Rocking Electric Furnace. High strength, alloy automotive irons poured at 2800-3000° F.

• No. heats per day—7 • Av. heat weight—1000 lbs. • Total lbs. cold melted—168,930 • Av. power consumption, including preheat—549 KWH/ton • Av. power cost @ 1¼c/KWH—$6.86 • Av. electrode consumption—4.15 lbs./ton • Av. Electrode cost @ 22c/lb.—$.913/ton • Av. no. heats/lining—253 (9-month average) • Av. refractory cost—$3.64/ton.

NOTE: *Operator handles two such furnaces all day. Furnaces are equipped with automatic electrode control as well as automatic rocking control.*

FASTER, CHEAPER, BETTER MELTS IN SINGLE or MULTIPLE OPERATION

Detroit Rocking Electric Furnaces achieve increased production at reduced costs, with rigid control over quality.

The above operating graph of a type LFY, 175 KW, 700 lb. nominal cold charge capacity Detroit Rocking Electric Furnace melting high strength alloy automotive irons is typical of one day's economical operation. Multiply this day's savings by the working days of the year and you realize the owner's great savings.

Besides optimum power use, all-electric operation precludes handling and storing messy, bulky fuels. Equally advantageous is the positive control of operational speed, composition quality and other melting factors. Out-of-production time due to burned-out linings is minimal. Spare, previously-lined furnace shells are quickly, easily installed.

Other saving features are fast, uniform outputs; lowest metal loss by shrinkage; conversion of shop borings and turnings with least loss from oxidation. The arc is automatically established clear of the molten bath at all times. The metal is never a part of the electrical circuit, assuring uniform temperatures within the melting chamber.

Detroit Rocking Electric Furnaces are available in 10 to 4000 lb. capacities with either conical or cylindrical chambers. Individually designed to meet your plant electrical specifications.

Whether you melt ferrous or non-ferrous metals, send us your production data. Our engineers will furnish you facts on how you gain ultimate operating economy with positive melt-quality control, using the Detroit Rocking Electric Furnace suited to your requirements in size, capacity and use. Address:

DETROIT ELECTRIC FURNACE DIVISION

KUHLMAN ELECTRIC CO. • BAY CITY, MICHIGAN

Foreign Representatives: In Brazil—Equipamentos Industriais "Equi" Ltd., Sao Paulo; CHILE, ARGENTINA, PERU and VENEZUELA: M. Cassavi, Inc., 150 Broadway, New York 7, N. Y.; MEXICO: Cesa S. de R. L., Atenas 42, Despacho 14, Mexico City, D.F.

Foundry Training of

ENGINEERING GRADUATES

A panel discussion on the subject, "The Employer Looks at the Engineering Graduate," was presented at the Ohio Regional Foundry Conference, Mar. 11. Experiences of various foundries in training young engineering graduates are described in the accompanying remarks of the various panel members

By Walton L. Woody, Vice President in charge of Operations, National Malleable & Steel Castings Co., Cleveland

MANY of us who are engineering graduates now in the foundry industry would have benefitted considerably if, during our college life, some contact and experience in the foundry industry had been possible. When I was graduated from the university and entered the industry 35 years ago, in 1914, I found it necessary to go back to night school where I took up such foundry and metallurgy courses as they had, as a means of supplementing my education. There were some men in our industry who looked upon an engineering graduate as an asset, but I must admit that this attitude did not exist throughout the shop.

WALTON L. WOODY

I would like to say here that at the time I entered the industry, I did not feel it owed me a living, but that it was offering me an opportunity. The wages paid me at that time were the ordinary wages of the day laborer.

National Malleable had an excellent training program through the 20's but during the depression it was dropped and not revived until a year and a half ago. It is now our plan to have trainees move among our plants, spending about five months in each, also attending a series of lectures at the same time. The program is very definite as to the time for each operation, as well as for the schedule of lectures and examinations.

Our applicants are chosen by contact with the colleges through the FEF, and we expect that the trainee will pay a portion of the expense by the work he performs during his 2½-years' training period. The work we believe is just as valuable as his education and the additional class work he will have with our company. It is by this means that he will be able to judge a day's work and to differentiate between relative difficulties of the jobs and the type of man suited to each.

Briefly, National Malleable trainees now thoroughly staff the organization and we can say that the program has paid off for us in ability and productivity. Most of the young men coming to us are ambitious, hard working, and apparently well adjusted to their progress through the corporation. They take difficult jobs and perform them in the best possible manner.

In our company, we try to develop a desire to do every job in a more economical manner than it has been done in the past and, in co-operation with others, to feel that just because a thing is done one way today, does not prevent it from being done a better way tomorrow. This, to us, is progress within our company.

Great progress has been made in the foundry industry toward making it one of the best and most progressive industries of our country. This work must be continued if we are to hold our own with other means of metals fabrication. We have a very interesting business where ambitious young men can find a host of things to improve and thus become useful and important to their company, as well as satisfied with themselves.

I want to emphasize that the most important lesson for the trainee is that he learn how to supervise. This is repeated over and over again in our training program.

By William J. MacNeill, Assistant to the President, Dayton Malleable Iron Co., Dayton, O.

WE AT Dayton Malleable have gone about the selection of engineering graduates in a rather cautious manner, feeling that through proper choosing of men for our staff, together with some of our other activities, we would prevent turnover among our student trainees. We do not favor any particular school and have boys from Cincinnati, M. I. T., and Cornell in the plant at present.

WILLIAM J. MacNEIL

Our training program is designed to permit progress of the graduate as he absorbs the activities of the different plant sections and departments. We have found that many of these young men have the preconceived idea that mechanical understanding or mechanical achievement is the measure of their training progress. In our case, we believe this to be so, but, in addition, the student must understand the relationship of each department to the rest of the plant, the methods of supervising the staff and the needs of the men who work in a given type of job.

From department to department these characteristics vary, and it is not possible for a student to under-

(*Continued on page* 208)

A Voice from the Scrap Pile

MANY OF OUR DEFECTS CAN BE TRACED TO IMPURITIES IN MOLTEN METAL...WHY DIDN'T THE FOUNDRY USE FAMOUS CORNELL CUPOLA FLUX TO CLEANSE OUR METAL BEFORE WE WERE POURED?

Famous CORNELL CUPOLA FLUX

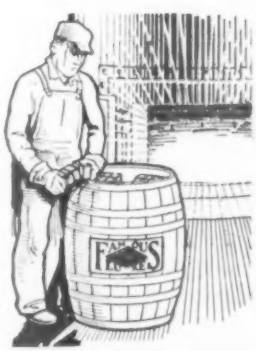
Purges molten metal of foreign matter so that you pour clean, hotter and more fluid iron. Greatly reduces sulphur.

By reducing chilled sides, hollow centers and hard spots, it plays an important role in eliminating many expensive makeovers.

Reduces cupola maintenance. Keeps cupolas cleaner. Drops are cleaner. And by reducing erosion of brick or stone, it prolongs the life of cupola lining.

Another big advantage is the PRE-MEASURED SCORED BRICK FORM which simplifies the use of flux and saves labor.

You toss Famous Cornell Flux into cupola with each ton charge of iron or break off one to three briquettes (quarter sections) for smaller charges—an operation that takes but a few seconds.



WRITE FOR BULLETIN No. 46-B

The CLEVELAND FLUX Company

1026-1036 MAIN AVENUE, N.W., CLEVELAND 13, OHIO

Manufacturers of Iron, Semi-Steel, Malleable, Brass, Bronze, Aluminum and Ladle Fluxes—Since 1918

FAMOUS CORNELL FLUXES
Trade Mark Registered

Write for Bulletins

Famous CORNELL ALUMINUM FLUX

Produces clean, tough castings. No spongy or porous spots even when more scrap is used. Thinner yet stronger sections are poured. Castings take a higher polish. NO FUMES! Exclusive formula prevents obnoxious gases. Metal does not cling to dross.

Famous CORNELL BRASS FLUX

Makes metal pure and clean, even when dirtiest brass turnings or sweepings are used. Produces castings which withstand high pressure tests and take a beautiful finish. Saves considerable tin and other expensive metals. Crucible and furnace linings are preserved.

Famous CORNELL LADLE FLUX

Place a few ounces in bottom of ladle, then tap cupola. Metal is thoroughly cleansed, foreign impurities are easily skimmed off. Ladles are kept clean, there is less patching and increased ladle life. Metal temperatures are retained during transfer to molds.

(*Continued from page* 206)

stand these variations by breezing through mechanical operations, in a matter of days or weeks. Even from the standpoint of mechanical understanding, it is almost impossible for a student to be placed in contact with more than a few specific jobs, and he does not have an opportunity to witness all operations on a wide variety of foundry products.

We believe that, in addition to our careful preselection, our close contact with these graduates during their training period is responsible for the fact that we still have all of the 12 engineers employed since the war. The managers of our plants have made it a practice to get together with these students about every six weeks for an evening session, at which a very frank and open discussion has prevailed. We have told these boys that whatever they say is entirely off the record, and we have religiously lived up to this promise at all times. As a result, we have obtained some amazing, as well as amusing, glimpses of our company which have been valuable to us on the managerial end.

Some of these boys are now beginning to take on responsibilities, and it is the feeling of our entire organization that our efforts along this line will have a handsome payoff.

By John M. Price, President, Ferro Machine & Foundry Co., Cleveland

IT WAS just three years ago that Ferro hired its first engineering graduate for its training program. Today two of the men from different training programs are running production lines; one is superintendent of our sand control, another is night cupola foreman, another is in charge of quality control and special scrap assignments, and one of them is superintendent of the coreroom which has a work force of 350 people.

JOHN M. PRICE

These candidates for our training program have been a result of a combination of factors. Several technical schools regularly visit our foundry and representatives of our company visit the colleges connected with the Foundry Educational Foundation. Both means have provided us with a number of candidates. We feel that the young men who have visited our plant and who have expressed interest thereafter are most certainly better candidates than those who merely inquire through correspondence.

Our program has not been rigid, nor does it follow too strict a schedule. Our premise is that a trainee is to "learn by doing" and with this fundamental in mind, one can well imagine that we have not tried to train our men by observation. We feel that if a man has done and can do a job himself, it is much easier for him to break in a new workman which, after all, is one of the supervisor's or manager's chief responsibilities, no matter at which particular level of company management he stands.

Our program has averaged for the individual between one and two years, although at times we have felt justified in removing a trainee and placing him on a specific assignment. All of this, of course, is gaged on the activity of the company.

With all graduate engineers we have a three-month probationary period, at the end of which the trainee and the company talk things over very thoroughly. The trainee looks at us in terms of his future career and we, in turn, look at him in relation to his value as a member of our staff. At the end of this three months we either terminate the arrangement or he gets a raise and stays with us. Many young men find that they are not mentally adapted to production work or decide in the three-month period that the foundry game is not to their liking. In such cases it is best for them as well as for us that the connection be terminated.

Two observations I wish to pass along and which are the results of our association with the engineering graduate:

1. Some of the boys quickly become impatient with the routine of learning minor operations and want to do bigger things in a hurry. While some things can be taught directly, others must be learned through absorption. Getting acquainted with what makes a plant tick, what working men's reactions are under various conditions, the philosophy of the company you work for, are things not learned in months or a year. The prospective supervisor must develop a good understanding of considerably more than the mechanics of production.

2. Other boys have a difficult time reconciling the theories of manufacturing as they learned them in school with the actual practices of the particular plant at which they work. By all means ask why it can't be done a certain way, but be sure you get the final answer which might be the very simple one: "It costs too much money."

We feel that our foundry has gained a great deal through the training and addition of engineers to our supervisory personnel. It is not natural for a trained engineer to be satisfied with things as they are or to accept conditions on the basis that they have been that way for years. The engineer who graduates into supervision has the equipment for planning better methods and procedures, as well as bringing to his job more intelligent handling of the people working for him. With the support of Foundry Educational Foundation, a program for improving foundry management is now well under way. As it continues to develop, the industry, I am sure, will soon reflect this improvement and take the place it should occupy as a leading basic industry.

By Victor E. Zang, Vice President in charge of Research, Unitcast Corp., Toledo, O.

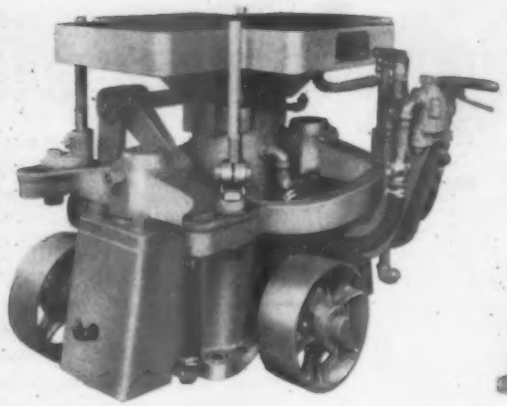
THE manner in which our company became interested in engineering graduates might be interesting to most foundrymen.

During the middle 30's the chairman of our board of directors threw a bombshell into one of our meetings by asking how long we thought the General Manager would be around. Most of us had not thought about this particular fact, but from that date on the interest of our company in preparing men for managerial positions has grown steadily.

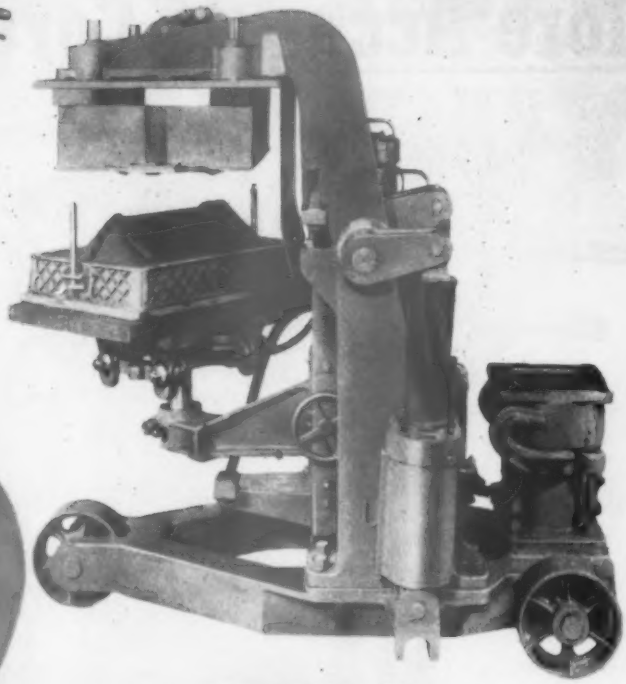
VICTOR E. ZANG

At present we have a standing policy of taking two summer students per year, during which period we get a chance to look them over and they, in turn, make up their minds about us. We do not urge them to come back the following summer unless they are graduating, in which case we discuss with them the possibility of permanent affiliation with our staff. Should the student have another summer or two of work ahead of him, we prefer sometimes that he work in other plants, feeling that if we have done our job and

(*Continued on page* 210)



No. 681-C
Portable Jolt Stripper



No. 612 Portable
Jolt Roll-Over Pattern Draw

Pace Setters

A COMPLETE LINE PROVEN IN SERVICE INCLUDING—

PLAIN AIR JOLTS
in 12 different sizes

JOLT SQUEEZERS
fast sturdy machines—3 sizes

JOLT STRIPPING PLATES
4 sizes ranging up to 16" draw

JOLT, SQUEEZE, STRIPPING PLATE AND PATTERN DRAWS
Popular for medium service —2 sizes

PORTABLE JOLT ROLL-OVER AND PATTERN DRAW
A heavy duty thoroughly dependable machine—portable

JOLT ROLL-OVER AND PATTERN DRAWS
Fast large capacity machines with roll-out conveyors—4 sizes

Write for fully descriptive catalog giving complete specifications.

● Speed up your production and keep competitive with Johnston & Jennings molding machines. The No. 681-C jolt stripper pictured above—furnished portable or stationary—features a valve-less, shock-less, jolt free from rebound, a positive draw, speed of which is variable to meet different conditions,—and complete enclosure of all working parts, thus assuring years of efficient trouble-free service.

The No. 612 Portable Jolt Roll-Over is designed specially for work requiring absolute accuracy in ramming and drawing. It is ideally used for making the intricate cores and molds required in aircraft and other precision industries. Use of two roll-over cylinders and oil dash pot control assures smooth uniform operation. "J & J" has just the machine you need.

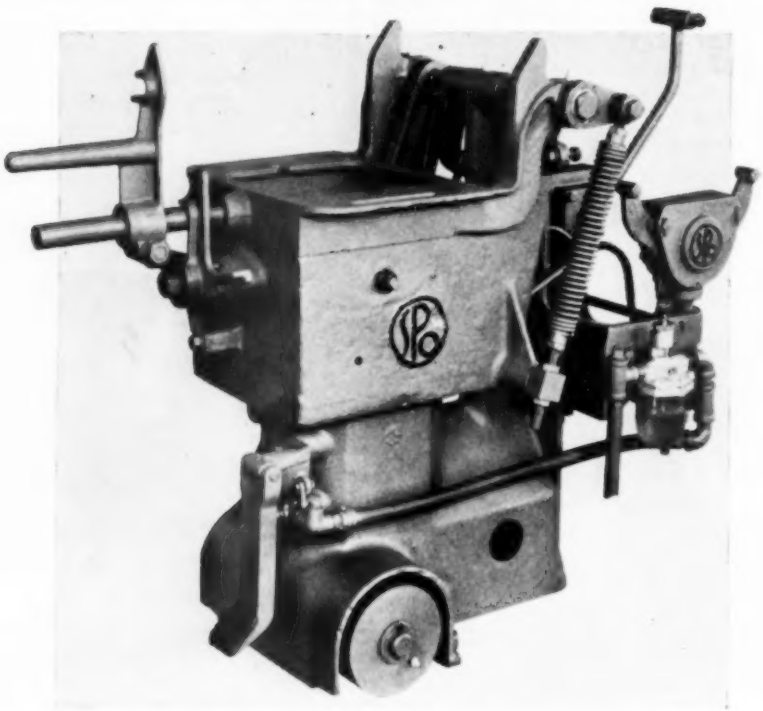
Write or phone about immediate deliveries on these and other types of J & J machines.

THE J & J JOHNSTON JENNINGS CO.

867 Addison Road • Cleveland 14, Ohio

IMPROVED UP-TO-THE-MINUTE MOLDING MACHINES FOR EVERY NEED

If You Want
More Accurate Cores . . .



Get the Exclusive Advantages of the NEW SPO No. 5038 JOLT ROCKOVER DRAW MACHINE

Another *new* SPO molding machine designed to give utmost accuracy in the draw operation! Besides SPO's exclusive inverted twin jolt feature, the new No. 5038 hand-rockover machine embodies the power jolt, power draw (with two-speed draw control) and air-locked leveling bars. New accuracy and long life are yours to command in the new SPO No. 5038 machine. Get the full details.

Always find out first what SPO has to offer.

MEMBER

SPO INCORPORATED

Specialists in Molding Machines, Vibrators and Patterns for Production

7500 GRAND DIVISION AVENUE • • CLEVELAND 5, OHIO

(*Continued from page* 208)

if our company fits in with his desires and potentialities, he will seek us out at the time of his graduation.

It is remarkable how fast these young men can pick up the technology of the industry and, in addition, we have had several examples of boys being very well liked by the working force.

Perhaps the extreme in this regard occurred during the war when we hired a young college professor as an assistant to our coreroom superintendent. He had not been out of school too long and we felt he had excellent possibilities. As fate would have it, the core room superintendent passed away two days after this young fellow was placed on the job. He was made temporary superintendent until someone else could be found to take over the work. Each succeeding day, however, found him more adept in his position and after a few months the men themselves expressed the wish that he be retained as superintendent and that we not seek further for a so-called replacement. This is just what happened and as a result this man is still on the job and doing an excellent piece of work.

By Herman Ewig, Foundry Superintendent, Cincinnati Milling Machine Co., Cincinnati

CINCINNATI Milling has, over the years, developed a very thorough apprentice and advanced training program as a means of replenishing its staff in all fields. This not only includes foundry operations, but bridges over into engineering sales and research work in all departments.

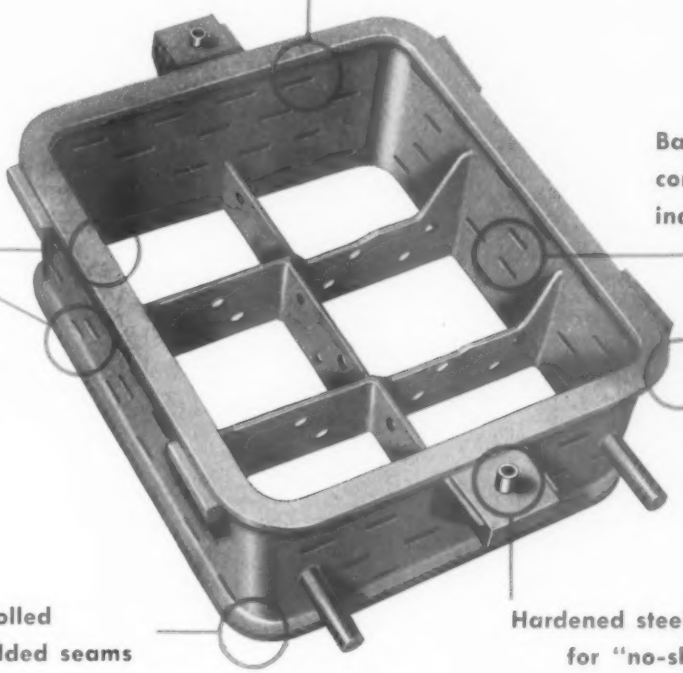
HERMAN EWIG

The Cincinnati plan is built up on the basis of achievement — in that the trainee, whether he be an apprentice or a university graduate, is given a requirement as the objective for that particular training unit, and is also allowed a maximum and minimum time in which to successfully complete it.

The advanced trainees, which include the university graduates, go through the program on an accelerated basis, although the same requirement sheets and examinations as to results are applied to them.

(*Concluded on page* 212)

THE REASONS WHY *Industrials'* THE BUY


Fabricated of Lightweight
Hi-Tensile Alloy Steel
Bars and other components constructed to customer's individual specifications
Full width bearing bar for strength and rigidity where it is needed most
Parting line surfaces precision-machined
Automatically controlled continuous fillet welded seams
Hardened steel pins and bushings for "no-shift" alignment

- All Flasks Normalized and Stress Relieved
- Low Cost
- Quick Delivery

Modifications or variations of the fabricated flask section pictured available in all sizes and shapes to fit individual needs.

Write for catalog

Foundry Equipment BUILT STRONGER TO LAST LONGER

INDUSTRIAL FABRICATING, INC.

TELEPHONE 6781

816 HALL STREET • EATON RAPIDS, MICHIGAN

Built from knowledge gained in 30 years of conveyor manufacturing . . . *"Junior"* is the champion for light loads. Low in first cost—low in operating and maintenance cost. Bolted track hanger construction permits erection by your own shop crew.

Chain is Keystone X-228, drop-forged of high carbon steel. Trolley brackets are drop-forged steel; wheels have antifriction ball bearings. Track is 3" Junior I Beam. Caterpillar or sprocket drives are available.

Here's the Conveyor to Cut Costs in Small Parts Manufacture

WRITE FOR LITERATURE

JERVIS B. WEBB COMPANY

8951 ALPINE AVE.
DETROIT 4, MICH.

OFFICES IN PRINCIPAL CITIES

CONVEYOR ENGINEERS AND MANUFACTURERS

(*Concluded from page* 210)

These trainees come from leading colleges of the country, which are visited regularly by a personnel representative of our company. All of these applicants are passed upon by a training committee which attempts to screen out in advance those whose qualifications do not indicate ultimate success.

Our company also co-operates very closely with the University of Cincinnati, where we select six or eight new co-operative students each year. These young men have alternating periods of work and school and we find that they are excellent material for our advanced program. This program, by the way, not only includes progress through the foundry departments, but also incorporates machine shop practice, as well as some work in the welding department, although the bulk of the time is in the foundry itself.

All classes—and there are many—which these trainees attend on company time, are paid for by us, although we do urge all of these young men to enroll in the evening college at the University of Cincinnati at their own expense, as a means of supplementing their university education.

We believe it to be true with most companies that somewhere in the organization an individual will take over the sponsorship of one or two boys and act as an advisor to him through the early years of his industrial life. This happens with us and, as a result, each of these young men has someone with whom he can consult about his problems. When those of us who have been in this business for many years look back upon our early period, we all realize that somewhere along the line a man was interested in us and provided the encouragement and inspiration which aided our personal success.

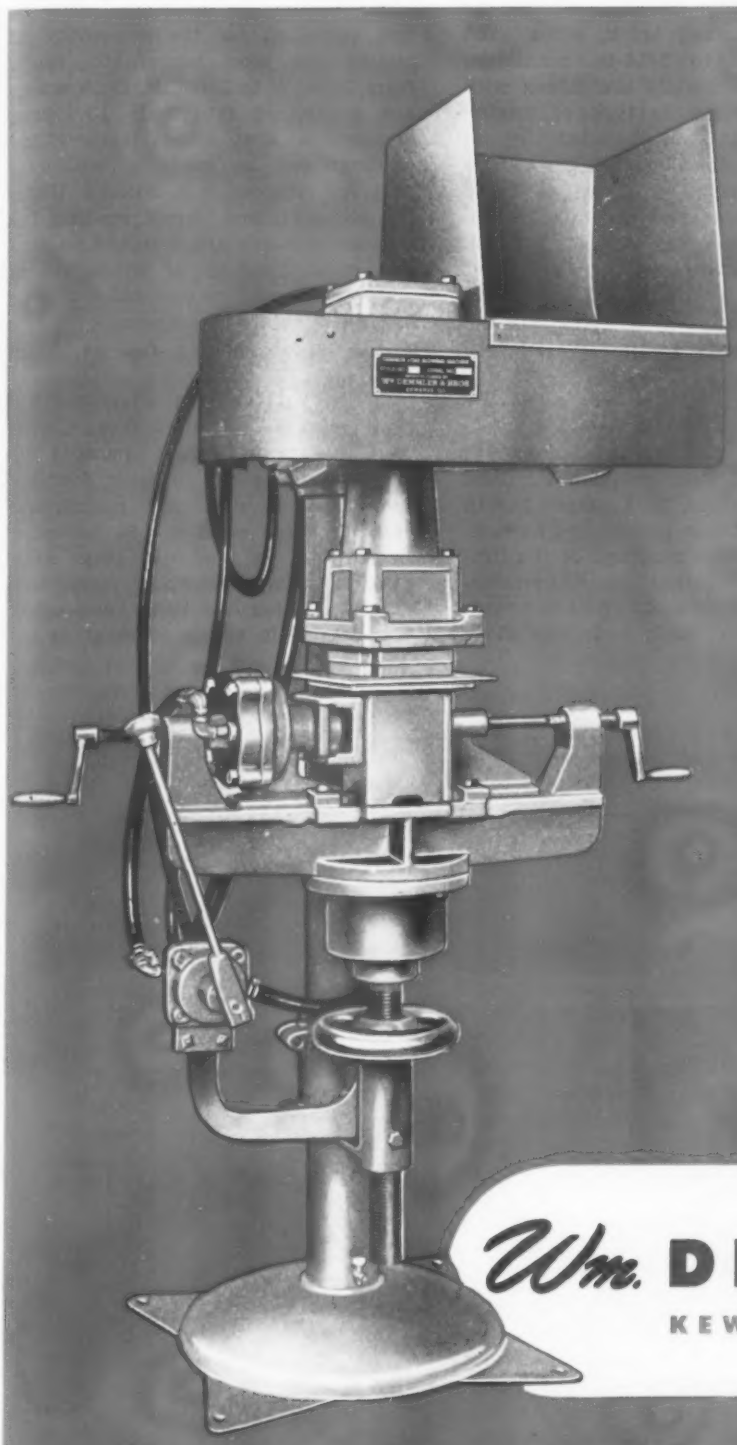
If every foundryman would only realize this and take it upon himself to encourage and advise young men in his organization, I am sure that the transition of the industry toward more thoroughly trained engineers will have its way smoothed.

Photography

Society of Motion Picture Engineers, 342 Madison Ave., New York 17, is distributing a questionnaire on high-speed photography in an effort to learn the various techniques employed in that field. Purpose of the society is to further the use of high-speed photography in industrial research and military problems and to foster new and improved equipment.

NO. 55 DEMMLER

CORE BLOWING MACHINE



IDEAL FOR FAST, ECONOMICAL PRODUCTION ON SHORT RUN JOBS

Short run jobs can be profitable, too!

The DEMMLER No. 55 is proving it every day . . . day after day in foundries everywhere. This small, rugged, efficient core blower is ideal for blowing cores weighing up to four pounds; was especially designed to fill the foundryman's need for just such work.

Sand magazine and carriage are aluminum castings, mounted on ball bearing rollers for utmost ease in pushing from filling to blowing position.

The DEMMLER No. 55 has *both* vertical and horizontal air operated core box clamps, controlled automatically by the same hand valve that blows the core.

This versatile machine will accommodate boxes 9 inches long, has sliding, quick change blow plates and features a trouble-free diaphragm type blow valve.

Sand magazine opening is 4½ by 9½ inches. Three different sand magazine sizes available.

Simple in construction . . . simple in operation, the DEMMLER No. 55 core blower is the economical solution—the profitable solution—to the rapid production of high quality small cores. Very reasonable in cost, the DEMMLER No. 55 is an extremely worthwhile addition to any foundry, large or small.

Illustrated specification sheet will be sent on request.

Wm. **DEMMLER** *& Bros.*

KEWANEE, ILLINOIS

Manufacturers of Core Blowing Equipment Exclusively Since 1911

NEW Equipment AND SUPPLIES

For Additional Information on these Items Use Reply Card—Page 219

(1) — Refractory Rammer:

Eastern Clay Products Inc., Jackson, O.—Machine has been developed to install refractory materials as a patch or lining to cupolas, ladles, electric furnaces, air furnaces, annealing ovens, and other equipment. The pressurized machine is said to meter and feed a dry refractory mixture at almost any desired rate or volume at any location convenient to an air line or air compressor. Refractory mixture is fed uniformly and without pulsation. Complete control is afforded over the moisture content, thickness of lining and density of packing. Machine will handle ganister, crushed brick, silica sand or grog up to 5/16-in. maximum size. The materials are mixed with clay in any simple type of mixing equipment and are handled dry up to point of discharge of gun where they are hydrated in an atomized spray of water and the mixture deposited instantly at high velocity on the lining wall. It is claimed that linings can be applied in one-fourth to one-half the usual time with a minimum of physical labor and with maximum quality and uniformity.

For More Details Circle No. 1—Page 219

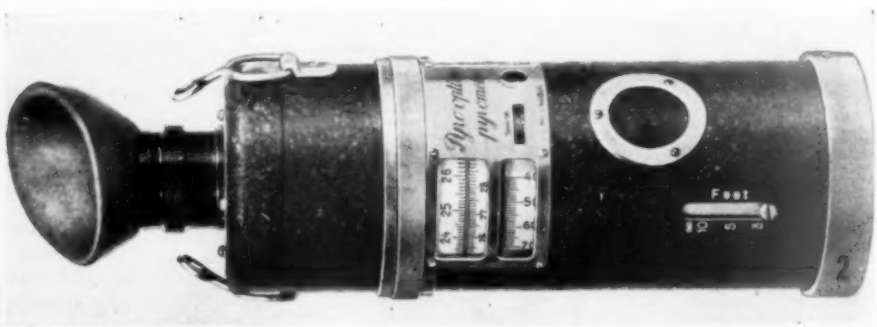
(2) — Optical Pyrometer:

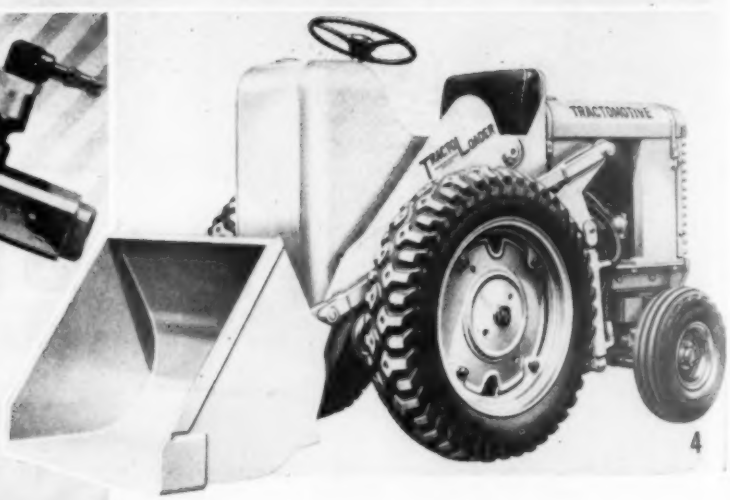
Pyrometer Instrument Co., Portland Ave., Bergenfield, N. J.—Open hearth optical pyrometer is designed for taking temperature readings of the limited range required for molten ferrous metals. The standard temperature scale for black body conditions permits coverage from 2200° F to 3000° F and, an additional scale in red, corrected for the emissivity of molten iron, steel, monel, etc., reads from 2400° F to 3300° F. Both scales are subdivided into wide 10-degree divisions so that actual temperature readings can be made to within a very few degrees, it is claimed. Units are self-contained, direct reading instruments which are designed to permit rapid reading of temperatures without the use of correction charts or other outside accessories.

For More Details Circle No. 2—Page 219

(3)—Vibrators:

Cleveland Vibrator Co., 2788 Clinton Ave., Cleveland 13—Pneumatically operated vibrators are suited to such foundry operations as removing matchplate patterns from sand molds, assuring steady flow of material from hoppers, moving granular materials through chutes and tubes, and other applications in which constant or in-





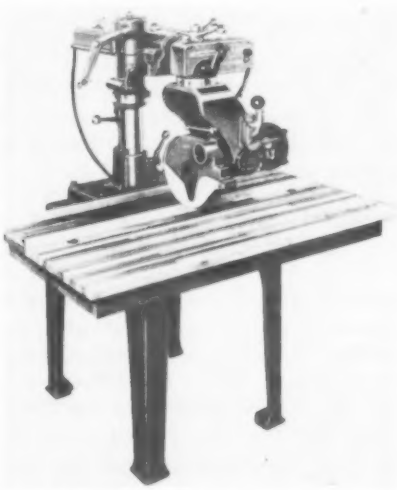
termittent vibration is a necessity. Seven sizes with five different mounting arrangements are available. Piston diameters of the various sizes are ⅜, ½, ⅝, ¾, ⅞, 1 and 1¼ in. Air consumption of the various sizes ranges from 5 to 8½ cfm on 80 psi line pressure. At that line pressure, speeds of operation range from 5100 vibrations per minute on the smallest or ⅜-in. vibrator to 1950 on the largest size.

For More Details Circle No. 3—Page 219

(4)Tractor-Loader: Tractomotive Corp., Box 632, Deerfield, Ill.—Ten cubic foot capacity tractor-loader has the bucket over the driving wheels and the steering wheels in the rear, which is said to result in good traction and easier steering. It is mounted on rubber tires and has a hydraulically controlled bucket designed to be dumped in whole or in part to a maximum dumping clearance of 4 ft, 6 in. Bucket has a forward crowd action and an automatic tilt-back feature which is said to permit getting a load without ramming. Overall length with bucket down is 9 ft, 5 in.; overall width outside tire measurements is 4 ft, 6 in.; wheelbase is 4 ft, 1 in. Base tractor for the loader unit is the Allis-Chalmers model B and provides 27.8 bhp.

For More Details Circle No. 4—Page 219

Saw: Walker-Turner Division, Kearney & Trecker Corp., 639 South Ave., Plainfield, N. J.—Newly developed radial saw for cutting wood, plastic and similar materials has the following features: Center pivot offset yoke permits all cuts to be made



in the convenient table area; 3⅛-in. capacity with 9-in. blade; geared motor has 2½ times overload capacity; 24-in. crosscut travel; rips to center of 48-in panel; good work visibility, and a holding design which incorporates taper latch indexing and locks conveniently located. The saw, which has a laminated hard maple table measuring 24 x 46 in., comes in two models—1½-hp single phase and 1½-hp three phase.

For More Details Circle No. 5—Page 219

Grease Remover: Preventive Maintenance Co., 1997 Fairfield Ave., Bridgeport, Conn.—Fluid grease and oil remover that emulsifies with water may be sprayed or brushed and is said to work effectively on metal or cement. The solution is applied to a greasy surface and the surface flushed with water to remove the grease or oil. The fluid is nontoxic and is said not to affect metal in any way.

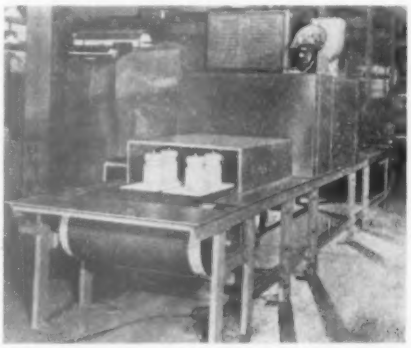
For More Details Circle No. 6—Page 219

Tool Holder: M. E. Cunningham Co., 97 East Carson St., Pittsburgh—Cast aluminum adjustable hand tool holder is available with

finger lever-type control for fast opening of holder when stamps or tools are inserted or released, or with knurled adjustable screw-type control for adjusting the lever spring to accommodate various size tools. Holder is available in four sizes for tools of ¼ to 1¼-in. diam. It may be used with square, octagon or round tools.

For More Details Circle No. 7—Page 219

Core Baking: Girdler Corp., Thermex Div., 224 East Broadway, Louisville 1—High frequency electronic corebaking equipment is sectionalized in ¼-ton (nominal rating) units each furnished with individual high frequency generator and electrode system, and individual exhaust blower to remove fumes and condensate. Each section is 5 ft long. Framework is structural grade steel and the enclosure is made of aluminum. Conveyor belt is made of woven steel wire capable of handling up to 900 lb of cores simultaneously; shear pin protects drive mechanism if accidentally overloaded; conveyor speed is variable up to 10 fpm. When additional sections are added, sufficient belt extension is supplied. Multisection models are available for initial installation; additional sections can be added any time after original installation, it is claimed. Overall height of the equipment is 8 ft, 2 in.; width, 5 ft, 5 in. Conveyor width is



36 in. Maximum vertical clearance for core and coreplate is 12 in. Power requirements are 230 or 460 v, 60 cycle, 3 phase current.

For More Details Circle No. 8—Page 219

Metal Primer: Rusticide Products Co., 3125 Perkins Ave., Cleveland—Protective coating for metal is described as a metal primer rather than a paint and is applied directly over rusted surfaces. It is a balanced formula of orthophosphoric, dichromate, extenders, and wetting agents. When applied, it is said to cause iron oxide (rust) to change chemically to iron phosphate, which is an inert, hard, dark gray substance. When the coating is dry, rust is stopped and paint adheres so tightly that moisture and oxygen cannot attack the metal, it is claimed. It is intended for both exterior and interior work.

For More Details Circle No. 9—Page 219

Air Compressors: DeVilbiss Co., 300 Phillips Ave., Toledo 1, O.—Air compressing outfits for stationary type installations are V-type four cylinder units employing a highly developed two-stage principle in both banks of cylinders. The displacement of the 10 hp unit, for example, is 47.86 cfm at 175 psi. Similar high displacement is attained in the 15 and 7½ hp models. All are available for 175 or 125 psi use.

For More Details Circle No. 10—Page 219

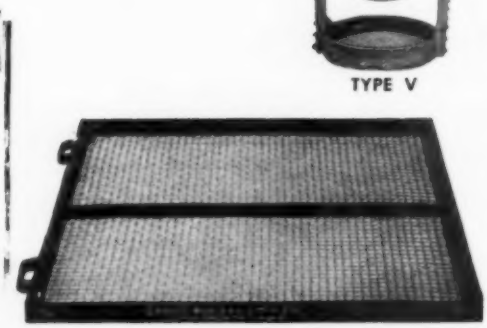
Smoke Control: General Electric Co., Schenectady 5, N. Y.—New smoke density indicator can also be used to control over-the-fire heated air to the fire-box to reduce excessive smoke and thereby improve fuel consumption and boiler efficiency. The equipment consists of a light source, a phototube holder, and an enclosure containing the required control and incorporating an indi-

How Are You Fixed for Extra Screens?

Combs sieve bottoms are made of very heavy galvanized wire in numerous gauges and mesh. Quantity discounts apply . . . it pays in many ways to order extra screens for your Combs units. Ask your foundry supply house.

TYPE V

TYPE CS



WRITE FOR BULLETIN "F" FOR FULL DETAILS.

TYPE CR

MESH	W & M GAUGE WIRE	V	CR	CS	V-5	MESH	W & M GAUGE WIRE	V	CR	CS	V-5
		LIST PRICES						LIST PRICES			
2	14	$1.50	$2.00	$2.50	$4.50	5	20	$1.50	$2.00	$2.50	$4.50
3	16	1.50	2.00	2.50	4.50	6	20	1.50	2.00	2.50	4.50
3½	18	1.50	2.00	2.50	4.50	8	20	1.50	2.00	2.50	5.50
4	18	1.50	2.00	2.50	4.50						

Discounts 1 to 5—Net, 6 to 23—5%, 24 or more—10%. Can be mixed meshes but for same type machine.

Steel Rims Type V $4.00 set; Types CR-CS 5.50 set; Type V-5 16.00 set

Combs • Gyratory • Foundry • Riddles

TYPE CR

TYPE V

TYPE CS

GREAT WESTERN MANUFACTURING CO.

LEAVENWORTH, KANSAS, U.S.A.

cator calibrated in Ringlemann units. A chart type recorder provides a continuous record of smoke density. The circular type recorder provides a record of the number of times the predetermined smoke density level is reached.

For More Details Circle No. 11—Page 219

Utility Lamp: Pompton Mfg. Co., Pompton Plains, N. J.—Portable utility lamp is equipped with a spring clamp provided with rubber insulated grips that can be clamped on any projection, enabling the user to spot the light where it is most useful in his work. Lamp socket is held in a double ball joint said to be adjustable to any angle. The 9-in. spun aluminum reflector is highly polished to provide the greatest amount of light possible from the bulb used. It is furnished with 20 ft of two-conductor cord.

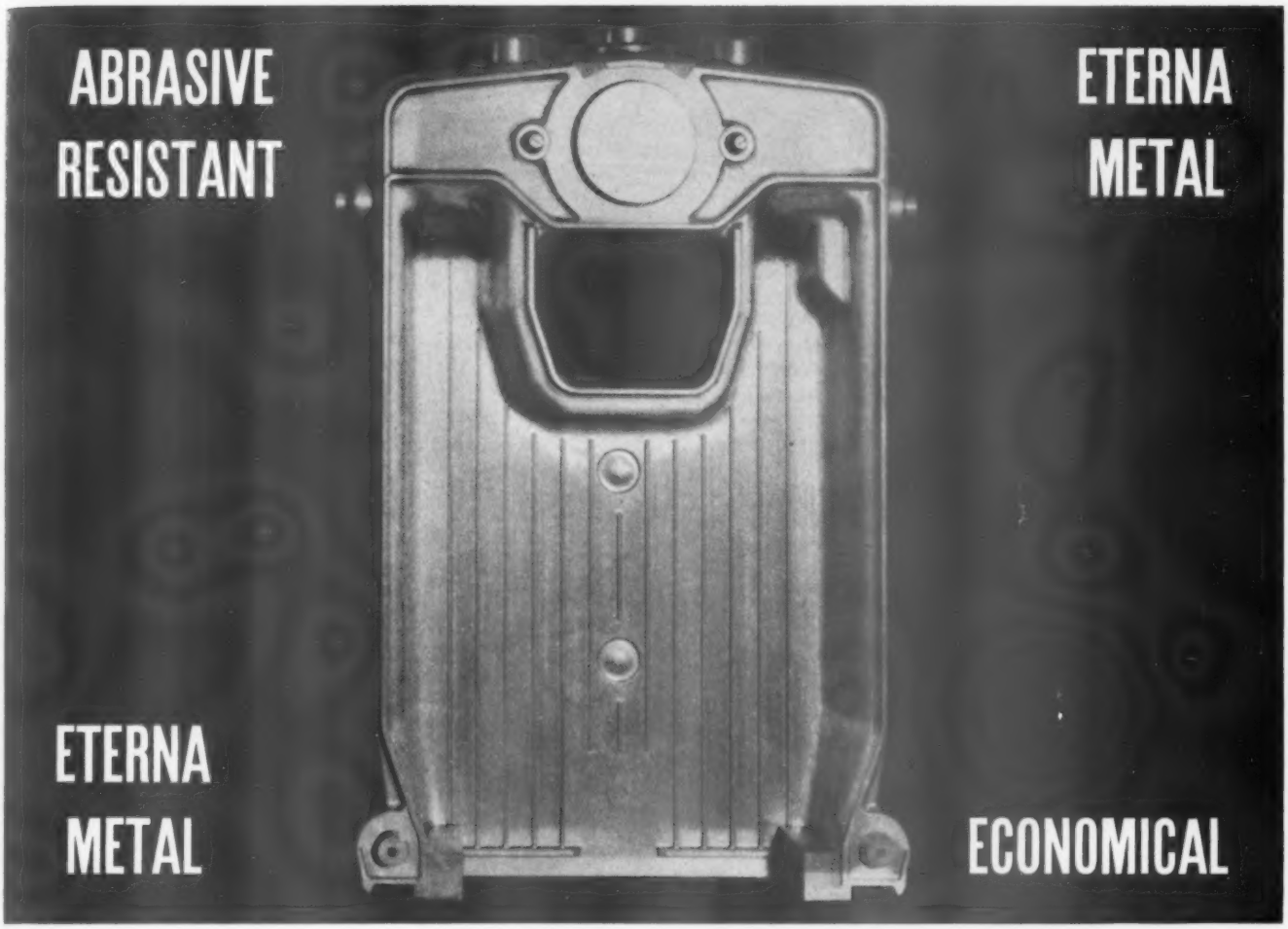
For More Details Circle No. 12—Page 219

Floor Truck: Market Forge Co., 25 Garvey St., Everett 49, Mass. —Floor truck is 63⅝ in. long, 30 in. wide and has a 60-in. length of loading space between end racks. It has a maximum capacity of 2500 lb distributed load. It is furnished in tilt, nontilt, wagon and dolly types with 4, 6 or 8-in. diam wheels of iron, aluminum, cushion rubber, hard rubber or plastic. All standard accessories, including end racks, pipe stakes, box sections, shelves, leaf trucks, cradle units, rod and tube units, etc., may be used on the truck.

For More Details Circle No. 13—Page 219

Plastic Paint: Munray Products Inc., 12400 Crossburn Ave., Cleveland 11—Plastic paint has been developed to protect metal, wood and ceramic surfaces against chemical attack by corrosive fumes, condensates, spillage, etc. The paint is a high

(*Continued on page* 218)



We Have Perfected a New Metal

THIS new Eterna metal possesses unusual wear-resistant qualities never before equalled for hardness and long life pattern service. It is a heat-treated alloy; and after the heat-treatment, a hardness will average between Rockwell B-75 and B-90. This outstanding property alone is responsible for imparting to the patterns their long durability. We are using this alloy to replace other metals in the construction of metal patterns; and reports that we have received on these patterns indicate that the material will outwear the metals ordinarily used, more than two to one. It also lends itself to producing better pattern castings as the metal flows freely in the mold and also reproduces more accurately. The material can be soldered or brazed, thus allowing for design changes when necessary.

We welcome inquiries for further information and assure you of a prompt reply.

WOOD AND METAL PATTERNS
KELLER AND DUPLICATOR WORK
MACHINE WORK
MALLORY METALS
BERYLLIUM COPPER
MONEL METAL

CITY PATTERN
FOUNDRY AND MACHINE CO.
1161 HARPER AVE.
AT RIVARD ST.
Phone TRinity 5-2430
DETROIT 11, MICH.
1913 — 1949
36 YEARS OF RESEARCH

EVERDUR CASTINGS
COPPER CASTINGS OF HIGHEST ELECTRICAL CONDUCTIVITY
PERMANENT MOULDS
BRASS, BRONZE AND ALUMINUM CASTINGS

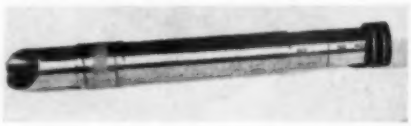
© 1949

(*Continued from page* 216)

solids coating said to air dry quickly by solvent evaporation to an adhesive, hard wearing, flexible, glossy coating without the necessity of priming the surface being coated. It is claimed that the nonoxidizing coating permanently maintains its flexibility over a wide range of temperatures and is recommended for service to 180° F.

For More Details Circle No. 14—Page 219

Microscope: Buhl Optical Co., 1009 Beech Ave., Pittsburgh 12—Pocket size microscope is adjustable to 40, 50 and 60 magnification. It is a precision made instrument containing a fully corrected optical system with acromatic objective and



is said to render a well defined image. It is ¾-in. in diam and 5 in. long when closed. The body is brass, satin chrome finish. It has a self-contained reflector.

For More Details Circle No. 15—Page 219

handles and machines in 15* minutes

WOOD-LOK — which replaces hot animal glue—does a better filleting job. It shrinks the leather tightly into place in 15 to 20 minutes . . . minimizes the use of facing fillets . . . allows ample time for accurate registration and clean handling. Excess glue is easily removed with a damp cloth.

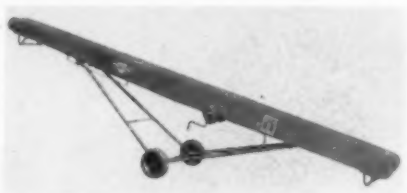
WOOD-LOK is a cold, liquid resin glue. Ready-for-use without cooking, heating, mixing. It remains in perfect liquid form for months — not 3 to 4 hours. When bonding wood-to-wood, it can be handled and machined after a clamping time of only 15 to 35 minutes*—instead of 6 to 8 hours. Its extremely strong, moisture-resistant bond is unaffected by damp molding sand or long periods of storage.

WOOD-LOK has been fully shop tested . . . is in full supply . . . available in steadily maintained deliveries. Write for a sample. Address: 270 Madison Ave., NEW YORK 16; 3641 So. Washtenaw Ave., CHICAGO 32; 735 Battery St., SAN FRANCISCO 11, and other principal cities. In CANADA: National Adhesives (Canada) Ltd., TORONTO and MONTREAL. In ENGLAND: National Adhesives, Ltd., Slough.

National ADHESIVES

EVERY TYPE OF ADHESIVE FOR EVERY INDUSTRIAL USE

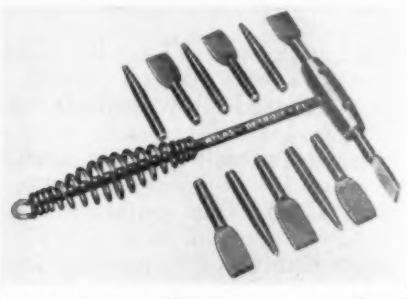
Belt Conveyor: Industrial Engineering & Mfg. Co., Brimfield, Ind.—Belt conveyor is designed to be made to any length required by adding sections and belting. Additional features claimed are that it can be furnished in any width and can be equipped to operate at any speed. Directional operation is reversible. By changing the conveyor belt to fit the need, it can be used to convey almost any product. With the addition of sideboards, it will load coal, stone, sand or aggregates. It is available with wheels for mobile use or without wheels if it is to be permanently installed for moving materials between floors, etc. Conveyor



may be powered by electric motor or gasoline engine. Motor and driving unit are mounted inside the formed steel sides, and are accessible through an opening in the bottom of the conveyor.

For More Details Circle No. 16—Page 219

Chipping Tool: Atlas Welding Accessories Co., 707 East Lewiston, Detroit 20—Weld chipping hammer is designed to use replaceable bits which are held in any desired position in the head by simple taper locks. Blades have been designed to provide good visibility, long life, easy access to tight spots and a wider



clipping edge. Hammers are offered in 12 and 16-oz weights with a choice of steel or wood handles.

For More Details Circle No. 17—Page 219

Meter Relay: Assembly Products Inc., Main at Bell St., Chagrin Falls, O.—Contact making meter for control applications is designed to make positive contact on changes in current or voltage of as little as ½ micro-ampere or a fraction of a millivolt. The contact point is adjustable over the entire scale arc. The relays consist of standard indi-

(*Continued on page* 222)

HELPFUL LITERATURE

50. Monolithic Refractory

Walsh Refractories Corp.—Illustrated leaflet "Here's Longer Life for Your Furnace Linings" deals with plastic fire brick monolithic refractory. It is available as ready-for-use plastic refractory for making durable one-piece linings, special shapes and economical repairs; and as Super Plastic furnace lining for extra strength and stability under severe temperature and load conditions.

51. Dielectric Heating

Allis-Chalmers Mfg. Co.—12-page illustrated bulletin No. 15B6431A discusses advantages of dielectric heating such as speed, uniformity, versatility, pushbutton control, high production, low maintenance costs, high quality products, and minimum wasted heat. Applications are portrayed, and specifications of heaters and auxiliary equipment are given.

52. Sand Conditioning

Pettibone Mulliken Corp., Beardsley & Piper Div.—4-page illustrated bulletin No. 1315 depicts applications of models L, M and S Screenarator sand conditioners and lists their respective specifications.

53. Testing Machines

Riehle Testing Machines Div., American Machine & Metals Inc.—8-page illustrated form No. R-99 explains and describes line of precision hydraulic testing machines and various accessory instruments which can be used with them in making precise measurements of impact, tension, compression, transverse loading and hardness.

54. Car Unloader

Marktroy Co.—4-page illustrated folder "Now! A Great New Car Unloader" deals with bucket type elevator which quickly transfers materials such as gravel, stone, coal, aglime, sand, cement, aggregates, cinder and chemicals from hopper bottom cars to trucks or stock pile at rate of 1½ to 2 tons per minute.

55. Cork Vibration Isolators

Korfund Co. — 4-page illustrated catalog No. C-1 lists five forms of cork available for vibration control which have static load ranges of from 250 to 30,000 pounds per square foot. Typical installations in which cork can be used satisfactorily to control transmission of vibration and noise are presented.

56. Pneumatic Tools

Skilsaw Inc.—12-page illustrated booklet "Pneumatic Skil Tools" presents data and prices on line of pneumatic hammers, grinders, drills, screwdrivers, nut runners, and accessories such as bits, finders, sockets and rivet sets.

57. Abrasive Cutoff Machines

Tabor Mfg. Co.—4-page illustrated bulletin devoted to pointing out eight design highlights of type D10FWP abrasive cutoff machine also includes specifications and capacities.

58. Cupola Suppressors

Whiting Corp.—Bulletin No. FY-158 describes cupola suppressor which consists of dust and spark suppressor, stack gas oxidizer and gas firing unit. Installed, this unit complies with air pollution ordinances enforced in most industrial localities.

59. Aluminum Alloys

Apex Smelting Co.—16-page booklet entitled "Apex Aluminum Alloys" covers such subjects as composition of aluminum alloys, typical mechanical properties of aluminum sand-casting alloys, sand-cast alloy heat treatments, typical mechanical properties of aluminum permanent mold alloys, permanent mold alloy heat treatments and typical mechanical properties of aluminum diecasting alloys.

60. Blocks & Sheaves

American Hoist & Derrick Co.—20-page illustrated catalog No. 300-6A lists and describes line of wire rope blocks and sheaves which can be obtained for all types of service. Information is given also on how to order these units and various accessories which can be used with them.

61. Power Lift Trucks

Revolvator Co.—4-page illustrated bulletin No. 166 presents information on four Go-Getter power lift trucks. These straddle high lift, fork high lift, platform high lift and low lift platform and pallet types cover all ordinary requirements for moving, lifting, piling and loading.

ADDITIONAL INFORMATION?

For additional information on any of the items described under "New Equipment and Supplies", "Trade Publications" or "Helpful Literature" in this issue — simply circle their corresponding item numbers on one of these cards.

FIRST CLASS
PERMIT No. 36
(Sec. 510 P.L.&R.)
Cleveland, Ohio

BUSINESS REPLY CARD
No Postage Stamp Necessary If Mailed in the United States

4c POSTAGE WILL BE PAID BY—

THE FOUNDRY
Penton Building
CLEVELAND 13, OHIO

Readers' Service Dept.

1	21	41	61	81	101
2	22	42	62	82	102
3	23	43	63	83	103
4	24	44	64	84	104
5	25	45	65	85	105
6	26	46	66	86	106
7	27	47	67	87	107
8	28	48	68	88	108
9	29	49	69	89	109
10	30	50	70	90	110
11	31	51	71	91	111
12	32	52	72	92	112
13	33	53	73	93	113
14	34	54	74	94	114
15	35	55	75	95	115
16	36	56	76	96	116
17	37	57	77	97	117
18	38	58	78	98	118
19	39	59	79	99	119
20	40	60	80	100	120

THE FOUNDRY 7-49
Penton Building, Cleveland 13, Ohio

Please send literature or detailed information on subjects circled at left to—

NAME TITLE

COMPANY

PRODUCTS MANUFACTURED

ADDRESS

CITY AND STATE

This card MUST be completely filled out. Please TYPE or PRINT.

62. Molybdenum Cast Steels

Molybdenum Corp.—20-page spirally-bound booklet entitled "Molybdenum Cast Steels" discusses foundry methods, results obtained and metallurgical and practical effects of incorporating molybdenum in cast steel.

63. Industrial Furnaces

Johnston Mfg. Co.—4-page illustrated bulletin No. 1100 describes comprehensive line of metal-heating furnaces, burners and equipment including forging furnaces, car bottom furnaces, rotating hearth furnaces, draw furnaces and several other industrial types.

64. Gas Burner

North American Mfg. Co.—4-page illustrated bulletin No. 58 describes series 58 gas burner in which exact air-to-gas ratios can be set by means of pointer and dial arrangement on burner. Described also are three different dials for accommodating gases of various British thermal unit content and specific gravities.

65. Molybdenum Cast Irons

Molybdenum Corp. of America—24-page illustrated booklet discusses methods of use and metallurgical effects of molybdenum in cast irons. One of easiest of alloying elements to use, molybdenum is readily absorbed or dissolved in melt of ferrous metal and is less susceptible to oxidation and more readily reducible by heat than is iron or steel.

66. Weight Printer

Yale & Towne Mfg. Co., Philadelphia Div.—12-page illustrated bulletin No. P1135 contains complete information on Load King scale weight printer which prints exact weight in numerals 9/32-inch high and 3/16-inch wide. In addition to explaining what printer will do, bulletin includes examples of printed tickets and bill of lading.

67. Blowers

Lindberg Engineering Co.—4-page illustrated bulletin No. 740 describes 360-degree full-positioned blowers that require no piping, welding or special installation procedures. Tabular data are included to aid in selection of proper blower for specific application.

68. Pump Drive

Stow Mfg. Co.—6-page illustrated folder describes flexible shaft pump drive engineered for tank truck service. Given also is alignment chart on how to determine proper shaft size for pumping liquids not exceeding viscosity of 650 Saybold Seconds Universal.

69. Tractor Shovel & Loader

Tractomotive Corp.—4-page mailing form MS-605A-947 describes model TS-5 hydraulically controlled Tracto-Shovel which is designed for mounting on Allis-Chalmers HD-5 diesel tractor. Several views of this unit in action are included also.

70. Cutoff Machines

Buehler Ltd. — 4-page illustrated folder entitled "Cut-Off Machines for the Metallurgical Laboratory" presents specifications and dimensions on abrasive cutoff machines, specimen cutter assembly and recirculating cooling system.

71. Flexible Shafting

Elliott Mfg. Co.—16-page illustrated catalog No. 49 covers flexible shaft machines incorporating 1/3 to 3-horsepower motors. Unit drives, attachments and push-pull controls are described also.

72. Cranes

Industrial Equipment Co.—20-page illustrated catalog No. MD-848 shows applications and outlines dimensions and construction details of Industrial single girder, motor driven cranes.

73. Air & Hydraulic Cylinders

Miller Motor Co.—Illustrated bulletins "J. I. C. Hydraulic Standards for Industrial Equipment", "Hydraulic Seals", No. A-105 and No. H-104, and air and hydraulic pressure and flow charts present useful information and data on standards, design and applications of air and hydraulic cylinders and component parts.

74. Cupola Collectors

Claude B. Schneible Co.—4-page illustrated bulletin No. 449 describes type SW water curtain cupola collectors for eliminating fly ash nuisance. Depicted also are various installations in which these devices have been successfully used.

75. Piston Size Calculator

Milwaukee Foundry Equipment Co.—Slide rule type "Piston Size Calculator" developed by W. W. Eichenberger simplifies selection of correct piston diameter for squeeze molding machine to secure desired sand pressure when flask areas and air line pressures are known. Reverse side of rule lists recommended sand pressures.

76. Refractory Products

Babcock & Wilcox Co.—20-page illustrated bulletin No. R-22 is descriptive of various castables, plastics and mortars for refractory use. Given also are suggestions for furnace and refractory economy.

77. Cherry Snap Flasks

V-G Flask & Fitting Co.—4-page illustrated price list No. 48-A gives current prices for various sizes and models of cherry snap flasks and discusses improvements in design. Specifications for various types are listed also.

78. Duct Fans

American Machine & Metals, Inc., DeBothezat Fans Div.—12-page illustrated catalog No. DB-4-48 presents Bifurcator fans for duct systems where harmful fumes are handled. Principle of operation, application, construction details, dimensions, capacity tables and suggestions on how to select proper units are included.

1	21	41	61	81	101
2	22	42	62	82	102
3	23	43	63	83	103
4	24	44	64	84	104
5	25	45	65	85	105
6	26	46	66	86	106
7	27	47	67	87	107
8	28	48	68	88	108
9	29	49	69	89	109
10	30	50	70	90	110
11	31	51	71	91	111
12	32	52	72	92	112
13	33	53	73	93	113
14	34	54	74	94	114
15	35	55	75	95	115
16	36	56	76	96	116
17	37	57	77	97	117
18	38	58	78	98	118
19	39	59	79	99	119
20	40	60	80	100	120

THE FOUNDRY 7-49

Penton Building, Cleveland 13, Ohio

Please send literature or detailed information on subjects circled at left to—

NAME TITLE

COMPANY

PRODUCTS MANUFACTURED

ADDRESS

CITY AND STATE

This card MUST be completely filled out. Please TYPE or PRINT.

FIRST CLASS
PERMIT No. 36
Cleveland, Ohio
(Sec. 510 P.L.&R.)

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

4c POSTAGE WILL BE PAID BY—

THE FOUNDRY
Penton Building
CLEVELAND 13, OHIO

Readers' Service Dept.

BALANCING

. . . . it's easy with the right grade of silvery

Experience proves a foundryman can easily achieve a properly balanced cupola charge when Globe Silvery Pig is available.

The knowledge and experience gained through the 75 years Globe has been supplying the foundry trade is yours for the asking. We'll help you select the type and grade of silvery that best suits your specific requirements.

Globe Silvery Pig is again available in any grade. Call or write us direct; or contact our sales agent listed nearest you.

CLEVELAND, OHIO
Cleveland-Cliffs Iron Co.,
Union Commerce Bldg.
Kerchner, Marshall & Co.,
Union Commerce Bldg.
Pickands, Mather & Co.,
Union Commerce Bldg.

PITTSBURGH, PA.
Kerchner, Marshall & Co., Oliver Bldg.,

PHILADELPHIA, PA.
F. W. Marshall & Co.,
Philadelphia Bank Bldg.
Rogers Brown-Lavino Co., 1528 Walnut St.

SAN FRANCISCO, CALIF.
H. L. E. Meyer Jr., and Co., 310 Sansome St.

CHICAGO, ILLINOIS
Miller and Co., 332 S. Michigan Ave.
Pickands, Mather & Co., 332 S. Michigan Ave.

CINCINNATI, OHIO
Miller and Co., 3504 Carew Tower

ERIE, PA.
Pickands, Mather & Co.

ST. LOUIS, MISSOURI
Pickands, Mather & Co.,
1171 Paul Brown Bldg.

CAMBRIDGE, MASS.
Charles A. Reed, 238 Main Street

GLOBE
Since 1872
SILVERY PIG

GLOBE IRON CO.

BLAST-FURNACE SILVERY PIG IRON • BESSEMER GRADES OF SILVERY,
SPECIAL, ALLOY, HIGH-SILICON PIG IRONS FOR PARTICULAR APPLICATION

JACKSON, OHIO

(*Continued from page* 218)

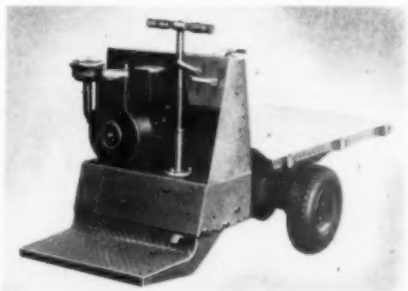
cating type meters with adjustable "Micro-Contacts," and have been used for automatic temperature control pyrometers. Meter measures 3⅜ x 3¾ in. and has over 3 in. of scale length. Meter case is one piece of clear molded plastic.

For More Details Circle No. 18—Page 219

Pump: Lear Inc., Romec Pump Co. Division, Abbe Rd. & Taylor St., Elyria, O. — Lightweight, portable, hand-operated pump is suitable for use for permanent installation in power shovels where a dependable transfer pump is required and also, for portable use with necessary equipment for pumping from barrels and skid tanks. Constructed principally of die cast zinc the pump has a stainless steel four-blade rotor shaft supported on two bearings. Shaft seal is synthetic rubber easily replaced from the outside. Pump may be used with light or heavy liquids such as oil, gasoline, kerosene and toluene with a capacity of 10 gal per 120 revolutions. Cranking may be as slow as 30 rpm to transfer 2½ gpm. Inlet and outlet ports are 1-in. tapered pipe thread. The unit pumps with strong suction up to a 20-ft lift, depending upon the volatility of the liquid, it is claimed.

For More Details Circle No. 19—Page 219

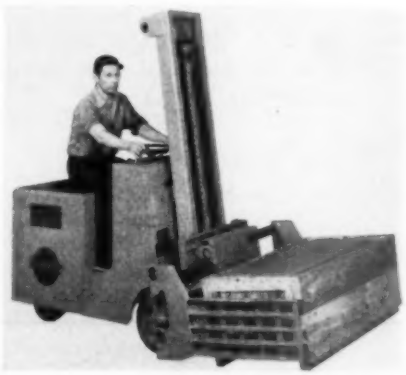
Power Wheelbarrow: Kwik-Mix Co., 126 Milwaukee St., Port Washington, Wis.—New attachments have been developed for the company's power wheelbarrow. They are a 4-ft stake platform body which is interchangeable with the 10-cu ft capacity hopper body, and



a riding step for the operator. In addition, a dual wheel has been placed on the direct steering mechanism. The flatbed platform gives the machine a 1200-lb capacity for truck handling loose loads, skids and bins. The platform body may be tilted for unloading certain kinds of heavy material. Machine is powered by a standard make 4-hp gasoline engine, at speeds of 1½ to 4 mph forward and reverse. All wheels are equipped with traction tread pneumatic tires. Machine is 33 in. wide.

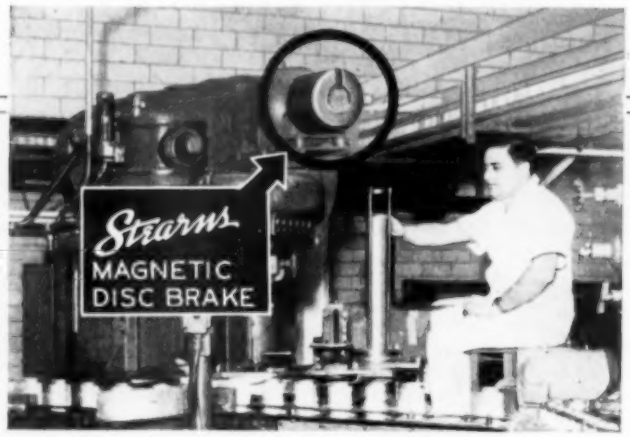
For More Details Circle No. 20—Page 219

Clamp Truck: Baker Industrial Truck Division, Baker-Raulang Co., 2168 West 25th St., Cleveland 13 —Lift truck utilizes hydraulically operated clamp arms to grip the load for lifting and transporting. Clamp



is constructed of all-welded steel and operates with dual double-acting hydraulic cylinders. It is mounted on the truck lift carriage with control valve mounted in operator's compartment. Pressure required is under

(*Continued on page* 224)



Watchdog AT BLATZ BREWERY!

Canning 328,000 cans of beer per day requires a smooth, even operation at the Blatz Brewery in Milwaukee. *Stearns Magnetic Disc Brakes* are an integral part of their modern equipment to quickly stop the process in case of jamming and miscapping.

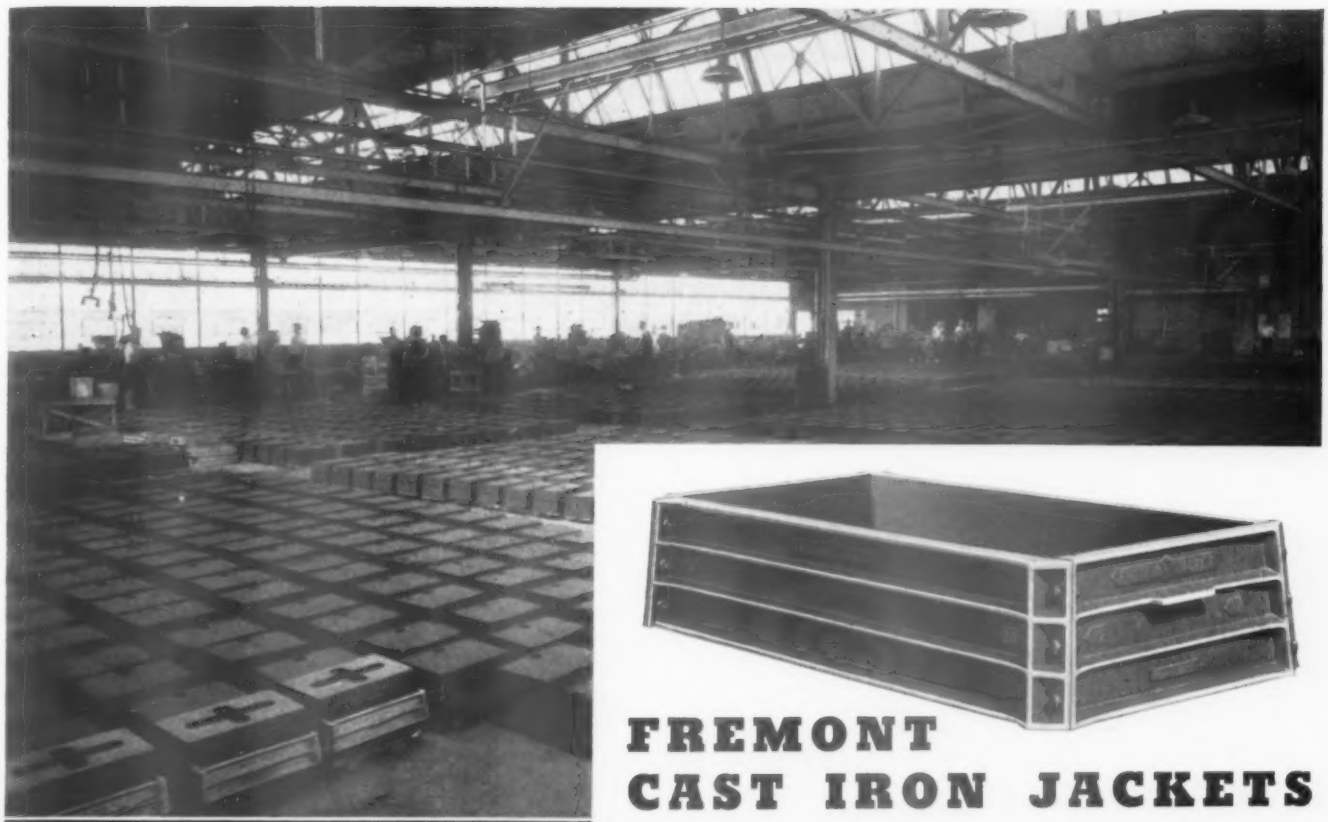
This is only one of many applications efficiently and economically solved with *Stearns Magnetic Brakes*. Reduce your production costs by eliminating expensive time lost in coasting motors and machinery. Available in all sizes and types to fit your needs.

Write Stearns Magnetic today — ask for Bulletin 604E.

A.C. or D.C. Magnetic Brakes for motor or machine mounting.

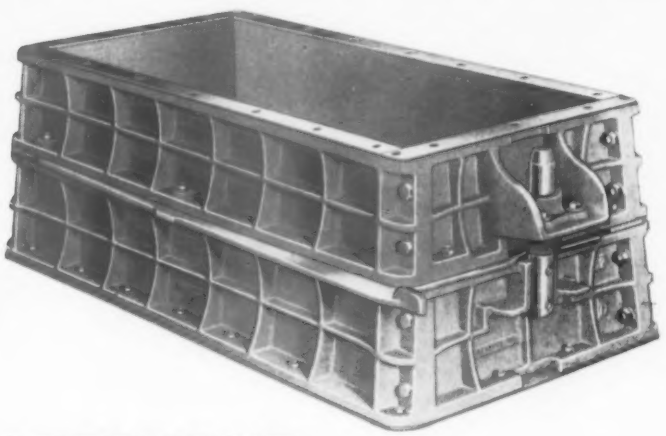
Stearns MAGNETIC MANUFACTURING CO.

662 S. 28th St., Milwaukee 4, Wis.



Wells Mfg. Co.'s new foundry in Skokie, Ill. Its 28,800 sq. ft. of floor is well covered by Fremont cast iron jackets and magnesium flasks. They're standard equipment.

FREMONT
CAST IRON JACKETS



FREMONT
MAGNESIUM FLASKS

BUILT FOR LONG SERVICE & FAST PRODUCTION

ALL ORDERS GIVEN VERY PROMPT ATTENTION

GROOVLOCK
THE FOOL-PROOF PIN

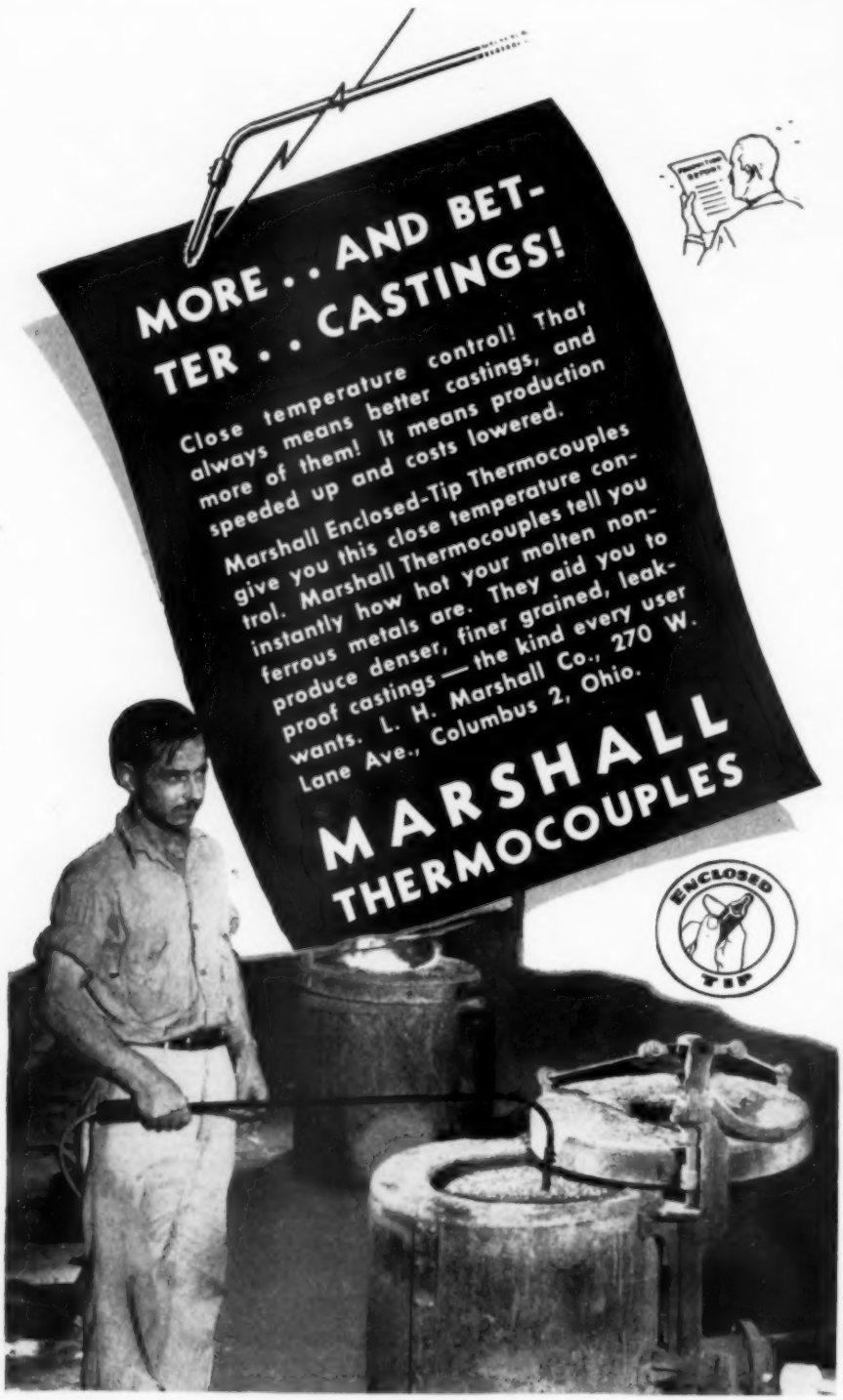
THE FREMONT FLASK CO.
Fremont, Ohio

(*Continued from page* 222)
full control of the operator, permitting handling of loads varying from fragile items to heavy industrial equipment. Length of clamp arms is 31 in.; opening between arms 18 to 66 in.; overall width of clamp, closed is 46 in., open, 72 in.

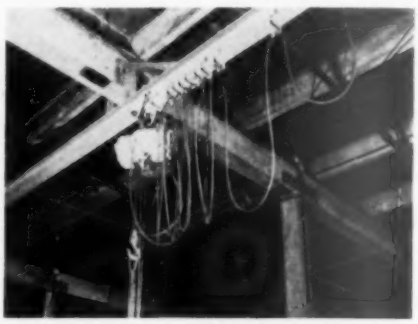
For More Details Circle No. 21—Page 219

Grease: Norma-Hoffmann Bearings Corp., Hamilton Ave., Stamford, Conn.—Grease, developed for use in ball and roller bearings to provide a stable, thoroughly clean lubricant, of suitable composition and consistency to provide lubrication over a wide temperature range without separation, drying out or hardening, is available in tubes for convenient servicing of bearings in the plant and field, and in larger containers where greater quantities are required. It is specially compounded for high resistance to oxidation in storage as well as in service. It is insoluble in water and will not emulsify or aerate in the presence of condensed moisture, it is claimed. It is suitable for lubricating grease-packed bearings or unsealed bearings.

For More Details Circle No. 22—Page 219


MORE . . AND BETTER . . CASTINGS!
Close temperature control! That always means better castings, and more of them! It means production speeded up and costs lowered.
Marshall Enclosed-Tip Thermocouples give you this close temperature control. Marshall Thermocouples tell you instantly how hot your molten nonferrous metals are. They aid you to produce denser, finer grained, leak-proof castings — the kind every user wants. L. H. Marshall Co., 270 W. Lane Ave., Columbus 2, Ohio.
MARSHALL THERMOCOUPLES
ENCLOSED TIP

Cord Trolleys: Manning, Maxwell & Moore Inc., Shaw-Box Crane & Hoist Division, 414 Broadway, Muskegon, Mich.—Conductor cord trolleys are said to make practical the supplying of electric current by a flexible conductor cord to electric hoists and other mobile equipment operating on monorail tracks. The trolleys are designed to permit the supporting of conductor cords



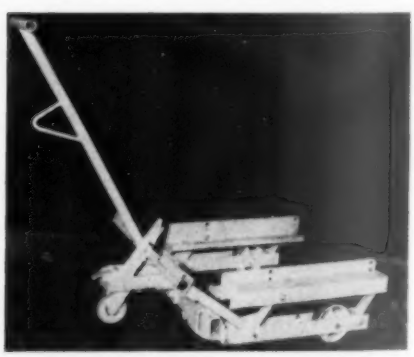
around curves and through switches on the same monorail on which the hoist is installed. The system may be used on tracks as long as 175 ft.

For More Details Circle No. 23—Page 219

Eye First-Aid Kit: Ohio First Aid & Pharmacal Co., 1285 West Sixth St., Cleveland—First-aid kit for eye safety and health was developed as the result of a survey made to first-aid dispensaries in plants throughout the country. It is intended to eliminate many of the dangers of impromptu first-aid treatments for eye injuries. Kit contains 15 eye health items housed in a transparent, air-tight plastic box, measuring 1¼ x 4¼ x 8¼ in. Kits are recommended as auxiliary equipment for regular first-aid kits. Refill materials are available.

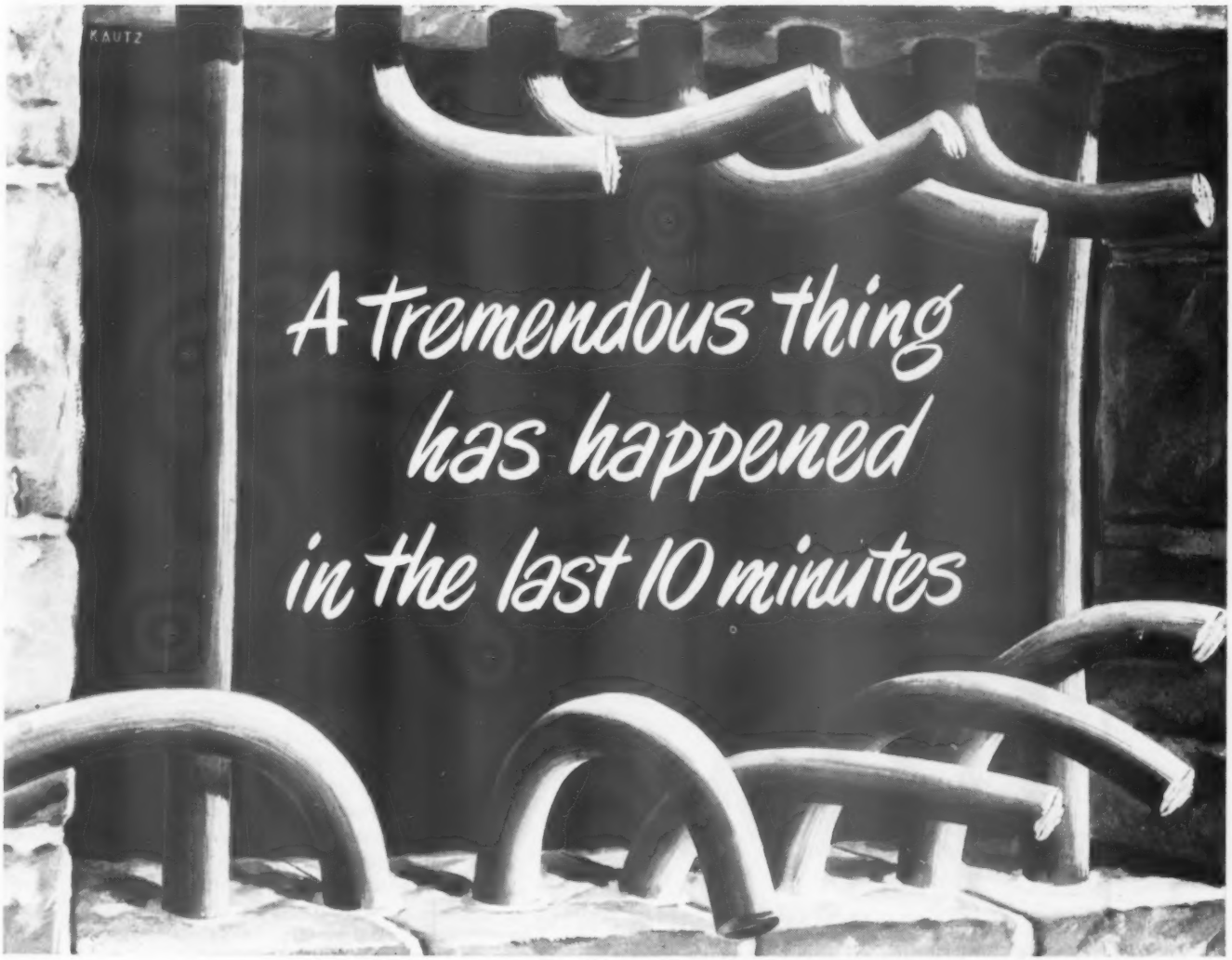
For More Details Circle No. 24—Page 219

Tote Pan Lift Truck: Lyon Raymond Corp., 1256 Madison St., Greene, N. Y.—Width of tote pan lift truck may be adjusted by loosen-



ing eight set screws and contracting or expanding the telescopic frame as required. Lowered height is changed by raising or lowering the side plates which are fastened by four bolts.

(*Continued on page* 226)



They say dictatorships are new and revolutionary... Actually, they're as old as time itself!

For thousands of years, most of the human beings who have peopled the earth have lived as the slaves or subjects of someone else.

The thing that is new and revolutionary and yours, is *freedom.*

Freedom to choose your job and to bargain collectively, knowing that in America there's no ceiling on advancement.

Freedom to invent new machines . . . and new ways to make them productive . . .

Freedom to invest money in new ideas . . . to *own* things . . . to manage our own affairs.

Freedom to mass-produce more and better goods all the time . . . with lower costs reflected in consumer prices and higher real wages.

Compared to the record of all civilization, this free way of yours is ten minutes old!

Yet in ten short minutes it's done *more good for more people* than anything that ever happened on earth.

In war, it enabled you in America to outproduce the rest of the world combined.

In peace, it's given us a standard of living ten times higher than that of the nation which shouts loudest that we have a dying economy.

Dying? We've just begun to live! We've just escaped from prison. If the way we live is ten times richer than theirs, that's not enough.

We can make it better still. We can eliminate the faults which remain. We can level off the sharp ups and downs of prices and jobs. We can make the final attack against poverty.

Today, the world is depending on us because we have depended on *ourselves.* Let's show others how that system works!

We can—if we'll work together and build together as Americans always have.

Let's keep on building. Build for Freedom . . . build for peace . . . build for a better world!

THE BETTER WE PRODUCE
THE BETTER WE LIVE

Approved for the PUBLIC POLICY COMMITTEE of the Advertising Council by representatives of Management, Labor and the Public:

EVANS CLARK, Executive Director, Twentieth Century Fund.

PAUL G. HOFFMAN, Formerly President, Studebaker Corporation.

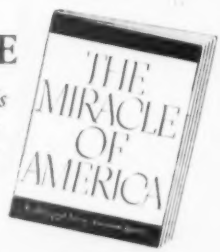
BORIS SHISHKIN, Economist, American Federation of Labor.

Published in the Public Interest by:

THE FOUNDRY

FREE

Send for this valuable booklet today!



In words and pictures, it tells you

—How our U. S. Economic System started
—Why Americans enjoy the world's highest standard of living
—Why we take progress for granted
—How we have been able to raise wages and shorten working hours
—Why more Americans have jobs than ever before
—Why the mainspring of our system is productivity
—How a better living can be had for all

MAIL THE COUPON to Public Policy Committee, The Advertising Council, Inc., 25 West 45th Street, New York 19, N. Y.

NAME_____

ADDRESS_____

_____

OCCUPATION_____

(*Continued from page 224*)

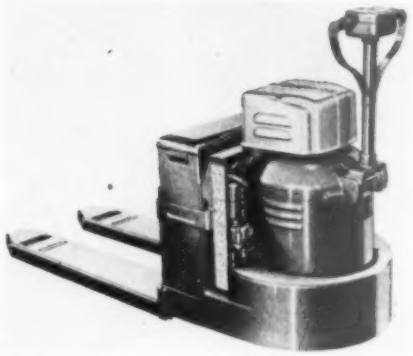
Two styles are offered, a narrow model designed to handle tote pans from 8 to 16 in. wide and a wide model designed to carry pans ranging in width from 16 to 24 in. Lowered height of the lifting forks can be adjusted from 2½ to 7½ in. The forks which lift and carry the pans are 22 in. long. Loads up to 1000 lb can be elevated by a single downward movement of the towing handle. Forks automatically lock in the raised position and are released by a simple pedal arrangement.

For More Details Circle No. 25—Page 219

Lift Truck Attachment: Hyster Co., 2902 N. E. Clackamas St., Portland 8, Oreg.—Hydraulically operated mechanism is designed to turn over or dump lift truck loads and is available for the company's 2000 and 4000-lb lift trucks. The revolving head on which conventional fork arms are mounted turns 180 degrees in either direction from the center. Capacity is 1725 lb for the small model and 3650 lb for the larger. The revolving head may be used in conjunction with a load-grab unit in place of the forks. That attachment is designed to side-squeeze loads with sufficient pressure to lift the load without the need of a pallet. A number of special purpose squeeze arms are available for various applications. Load capacity of the revolving head with the load-grab attachment is 1400 lb.

For More Details Circle No. 26—Page 219

Pallet Truck: Towmotor Corp., 1226 East 152nd St., Cleveland 10—Battery-powered hand pallet truck is designed for easy maneuverability in close quarters and is said to have a



high safety factor, even under maximum loads. Major features claimed include rapid lifting of loads, high traction, maximum power, safety handle with control buttons for either right or left hand operation, three-point suspension for smooth travel over uneven surfaces and differential-action trailer wheels that eliminate wheel scuffing and insure easy turning. It has an automatic power cut-off which, upon release of the control handle, cuts off the power supply to the motor and applies a brake to the drive shaft.

For More Details Circle No. 27—Page 219

Vacuum Cleaners: Breuer Electric Mfg. Co., 5100 Ravenswood Ave., Chicago 40—Heavy duty portable vacuum cleaners are built in four

sizes, powered by 2, 3, 5 and 7½ hp motors, explosion-proof if desired. They have static water lifts ranging

Ajax
shot
metals
for handy use in making modern alloys
SHOT COPPER . . . . . .
SHOT COPPER-NICKEL . . .
SHOT PHOSPHOR COPPER .
and other alloys
AJAX METAL CO., PHILADELPHIA 23, PA.
ASSOCIATE COMPANIES: AJAX ELECTRIC • AJAX ELECTROTHERMIC CORP. • AJAX ELECTRIC FURNACE • AJAX ENGINEERING

from 60 in. to 105 in. with air velocities from 315 to 480 mph, moving from 200 to 3600 cu ft of air per minute. Cleaners are designed to pick up wet or dry substances simultaneously without harm to the filter or tank. Cleaners are equipped with two intakes and one or both can be used with either 1½-in. or 2-in. hose and attachments, operating simultaneously. Machine is said to operate at top efficiency with a 60-ft hose attached to each outlet. Steel tank capacity is approximately 60 gal. Cleaners may be changed to blowers by movement of a single lever.

For More Details Circle No. 28—Page 219

Pallet Rack: Rack Engineering Co., 925 Liberty Ave., Pittsburgh 22—Pallet rack with shelves adjustable for any height load without the use of bolts or wrenches is designed for storage of loaded pallets. Shelves are supported at four corners on the notched uprights and can be adjusted upward or downward by fork lift truck, it is claimed. Constructed to handle standard size pallets, the base rack can be expanded in either direction through the use of additional units consisting of one upright section and necessary cross braces.

For More Details Circle No. 29—Page 219

Step-Up Handpiece: Wyzenbeek & Staff Inc., 838 West Hubbard St., Chicago 22—Handpiece for stepping up speed of small diameter rotary files, mounted grinding wheels or abrasive sanders with speeds of over 10,000 rpm can be used on the company's flexible shaft machines. By replacing the standard handpiece or anglehead with this step-up handpiece the speed is increased three times. It is available in two sizes to fit the various machines.

For More Details Circle No. 30—Page 219

Belt Grinder: Buehler Ltd., 165 West Wacker Dr., Chicago 1—Wet belt grinder is powered to drive two belts simultaneously at either 1600 or 3200 fpm. Belts are cloth backed silicon carbide with grits from 80 to 600 fabricated particularly for wet grinding with water or water soluble oils. Coolant is furnished each belt independently and uniformly by a valve controlled spray head connected directly to standard water lines or to a recirculating cooling system. Machine may be used for grinding standard tools or small production parts.

For More Details Circle No. 31—Page 219

Water Cooler: Ebco Mfg. Co., 401 West Town St., Columbus 8, O.—Heavy duty, ten-gallon, bubbler-type water cooler has been developed for installation in locations where the air is heavily laden with lint or dust, or high humidity conditions exist. The water-cooled condensing unit and other operating parts are located in the lower half of the cooler cabinet, which is closed to prevent circulation of air. This arrangement is said to protect the operating mechanism against being reached by corrosive fumes, lint or dust. Company has a line of 18 electric drinking water coolers all approved by Underwriters' Laboratories.

For More Details Circle No. 32—Page 219

AJAX-WYATT ELECTRIC FURNACE

This line frequency induction furnace, so universally used in the wrought brass industry, is now, because of improved linings, available for melting ferrous alloys used in the foundry industry.

AJAX ELECTRIC FURNACE CORPORATION
1108 FRANKFORD AVE., PHILADELPHIA 25, PENNA.

Associate Companies:
AJAX *Metal Company*
AJAX *Electrothermic Corp.*
AJAX *Electric Co., Inc.*
AJAX *Engineering Corp.*

Use of TELLURIUM

(*Continued from page* 77)

the 6-in. or the 4-in. blocks.

Brinell hardness values obtained on a ground fracture of the 6-in. block along a diagonal taken from the corner of the block at ½-in. intervals gave the data included in Table II. The treatments for A, B, and C were 0.025, 0.05 and 0.1 per cent tellurium additions, respectively. The numbers 1 to 4 indicate successive ½-in. traverses along a straight diagonal line.

It will be noted that increasing the amount of tellurium from 0.025 to 0.1 had relatively limited effect except with the softest iron. With the high and medium strength irons the carbides were stabilized to give a chill effect when the irons were sand cast even with only 0.025 per cent addition. The soft irons exhibited some response to the more concentrated tellurium treatment (0.1 per cent) but the best response is obtained when the iron is poured against a chill.

Chill Type Iron—Tests were also run with a chill type iron containing about 3½ per cent carbon and 1.2 per cent silicon which showed a mottled structure in the fracture of a 6-in. cube cast in sand. Prior treatment with 0.025 per cent tellurium resulted in a completely white fracture. The nature of the fracture indicated that this type of iron responds most satisfactorily to chill by tellurium. The small amounts of addition needed to effect a chill aids in reducing any tendency to objectionable gasification of the casting.

Tellurium Washes with Chill Type Iron—The mold wash used in the tests to be described were made from commercially pure tellurium powder by first mixing in powder form as follows: Tellurium 32 per cent, silica 60 per cent, alumina 6 per cent, iron oxide 2 per cent.

After thorough mixing, 1 lb of this powder was well shaken with 4 quarts of water. Plumbago was then added with continued shaking until a density of 27° Baume was obtained. Before use, ¼-pint of core gum mixed with hot water, to the consistency of molasses, was shaken with the above mixture in order to keep the particles of tellurium in place and to prevent spalling or flaking off from the surface treated either by brushing or spraying.

Conditions Were Standardized

The test block designed to promote study of amount of chill is shown in Fig. 3. The cast block 6 x 4 x 4 in. was poured against a 4-in. square chill and all molds were machine-prepared to standardize conditions with normal facing and backing sand, and the metal poured from a 300-lb bull ladle. Metal was poured against the regular chill block and against the chill block painted with the tellurium suspension already described.

With the regular chill method the depth of chill was neither uniform nor sharply defined, and the lower the pouring temperature the deeper the chill. After the tellurium wash the depth of chill was found to be uniform and sharply defined. However, the deeper chill was obtained with the higher pouring temperature.

Little difference in hardness of the chill surface was obtained under the two test conditions; the chief advantage in the use of tellurium was the uniformity of depth of chill, the restriction of the transition zone from chill to gray and the fine texture of the chill fracture.

Some illustrated examples will now be furnished on specific uses of tellurium in promoting chills with

(*Continued on page* 230)

FOR EVERY FOUNDRY PURPOSE

Goose Lake

FIRE CLAYS

• The most widely used of all fire clays in midwest foundries. They supply every bond and refractory requirement. These clays are prepared in a large, modern grinding plant, which for 32 years has served the foundry industry with prompt and dependable shipments.

Valuable consultation is available with experienced engineers for the best use of fire clays in foundry bond and refractory service. They often supply important help for the reduction of foundry scrap losses.

A new booklet with many pictures about the production of Goose Lake Fire Clays is available upon request. Write now for your copy.

Make "your" next car of fire clay GOOSE LAKE

Illinois Clay Products Company

FIRE CLAY • CLAY BOND • BRICK • BLOCK

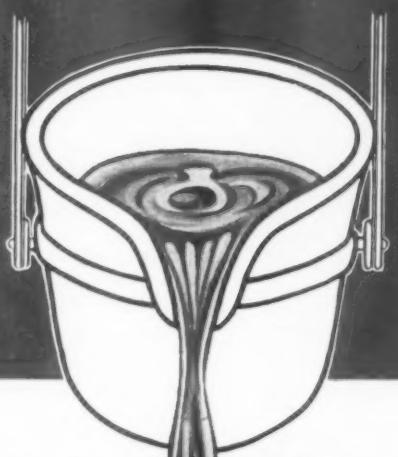
JOLIET, ILLINOIS

Our Own Source of Coal

Our Own Source of Ore

Our Own Coking Plant

Our Own Control of Operations



WOODWARD PIG IRON

America's largest completely independent and entirely integrated merchant iron producer.

WOODWARD IRON COMPANY

WOODWARD, ALABAMA

Independent Since 1883

GENERAL SALES OFFICES: 1515 First National Building • Birmingham, Alabama • Phone 4-6786

(*Continued from page* 228)

wheel iron, a high strength cast iron, and an ordinary soft gray iron. For any given iron the rate of cooling which must be exceeded to give a hard white chill with tellurium additions is critical. For different irons this critical cooling rate may vary considerably. Accordingly, for effective use of tellurium metal good control of iron characteristics is essential.

Some qualitative idea of the response of different irons to tellurium treatment will be evident from the several accompanying illustrations.

Wheel Iron—The determination of the chilling power of an iron melted for manufacturing car wheels is usually determined by casting an L-shaped section on a steel chill block. The casting is then fractured, the extent of chill being indicated by the length of white fracture up to the mottled zone. A more clearly defined measure of this chill is obtained on a ground and polished surface after etching in either a solution of picric or nitric acid in alcohol. Fig. 2-A shows the appearance of such a chill cast specimen after a polish-etch preparation.

The metal, after treatment with 0.005 per cent tellurium metal, was chill cast on steel, on graphite, and on block zirconium sand. The character and degree of chill is shown in Figs. 3B, 3C and 3D respectively. The tendency for increased depth of chill with both steel and block graphite may be noted along with the pronounced chill obtained in the air cooled top surface of the casting. The Rockwell "C" hardnesses of the chills were approximately 48 to 50.

Susceptibility to chill of standard 1.2-in. diameter arbitration bars cast in core is revealed in Fig. 4. In the untreated bar there is complete absence of white chill (Fig. 4A). With the addition of 0.005 and 0.01 per cent tellurium to the ladle the depth of chill is increased from about 4/32 to 10/32-in. (Figs. 4B and 4C, respectively). The hardness of the chill is about 49 Rockwell "C".

Test Wheel Iron

Wheel metal was also poured into a 1-in. square section of an open green sand mold and onto a warm steel chill plate forming the base of a similar mold cavity. This 1-in. square casting was 12-in. long. A transverse fracture of the bars was ground, polished and etched.

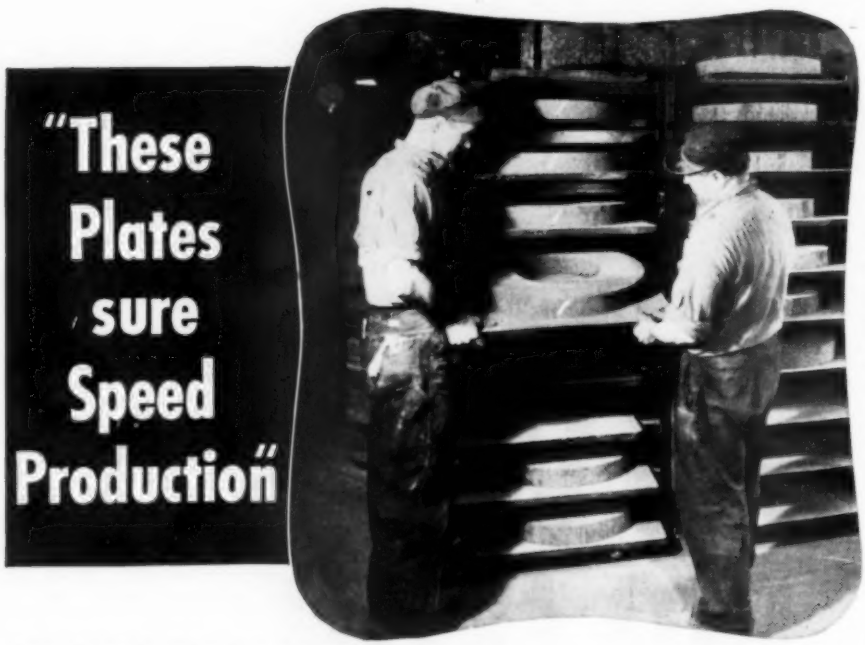
Without tellurium addition the chill appeared as shown in Fig. 6-A. However, when the ladle of iron was treated with 0.005 per cent tellurium metal the chill shown in Fig. 5-B resulted.

Pouring this same metal, treated with 0.005 per cent tellurium, into an open green sand mold without a steel chill base, the chill effect illustrated in Fig. 6 was obtained. Naturally, the chill was not concentrated on the base of the casting but extended rather uniformly around the edges. The result is comparable with that observed with the uniform peripheral chills obtained with the arbitration bars (Fig. 4) and further demonstrates the sharp demarkation obtained between the hard chill and the gray iron constituting the core of the casting.

Fig. 7 shows the fractures obtained in pouring wheel metal into an open 1-in. square green sand mold 12-in. long, in which the facing sand forming the base of the mold was impregnated with 5 per cent tellurium powder.

The use of a tellurium wash is of particular interest in localizing chills, and a cast gear and sprocket are used to illustrate this feature.

(*Continued on page* 233)



TRANSITE CORE PLATES are lighter, stronger, resist warpage

Core makers can handle more Transite* Core Plates at one time, thus make fewer trips. That means faster production with less fatigue and fewer accidents. Transite Core Plates offer all these advantages:

They Last Longer—Made of fibrous asbestos and cement, Transite Core Plates resist shock . . . are less likely to crack or break.

They Clean Easily—Core wash, sand, etc., do not stick as readily as to other materials. Both sides are usable.

They resist Corrosion and Warpage—Transite Core Plate surfaces stay smooth even after long service. Warpage is less than 0.1%.

They are Economical—Low price, low maintenance and long life add up to low cost.

To eliminate green cores and reduce baking time perforated core plates are also available.

For full details, write Johns-Manville, Box 290, New York 16, N. Y.

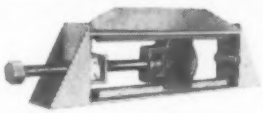
JOHNS MANVILLE JM PRODUCTS

*Reg. U. S. Pat. Off.

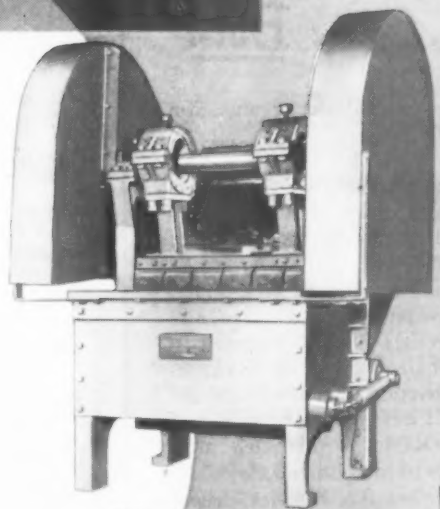
Johns-Manville TRANSITE CORE PLATES MADE OF ASBESTOS

The NEW WAY to go....

TOWARD FOUNDRY PROFITS



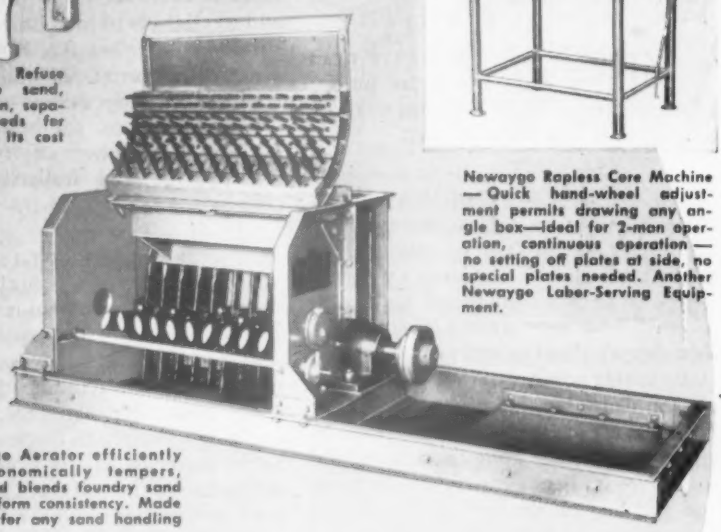
Newaygo Conveyor and Elevator Take-Ups—Self-aligning Roller, ball or plain bearings, for all standard shafts, 6" to 26" travel.



Newaygo Mill cuts costs for large users of sand. Salvages sand lumps from screens, separates non-magnetic tramp material and metal which escapes magnetic separator. All lumps reduced to proper grain size. Provision for eliminating float dust. For systems up to 120 tons per hr. for shake-out sand.

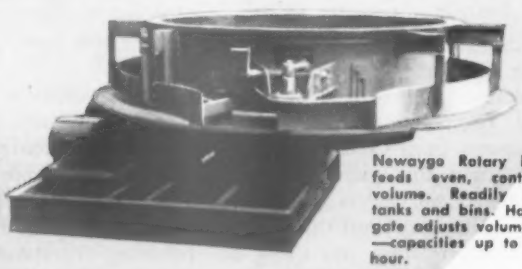
Newaygo Foundry Turntable —Standard sizes 8' to 24'. Segmental construction. Interchangeable gear sections. Variable speed drive. Underpan with plows handles spillage through grates.

Newaygo Core and Refuse Crusher recovers core sand, slag for iron reclamation, separates gaggers and rods for re-use. Quickly returns its cost in salvaged core sand.

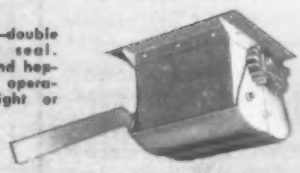


Newaygo Rapless Core Machine — Quick hand-wheel adjustment permits drawing any angle box—ideal for 2-man operation, continuous operation — no setting off plates at side, no special plates needed. Another Newaygo Labor-Serving Equipment.

Newaygo Aerator efficiently and economically tempers, cools and blends foundry sand to a uniform consistency. Made in sizes for any sand handling system.



Newaygo Rotary Plate Feeder feeds even, controlled sand volume. Readily attaches to tanks and bins. Hand crank on gate adjusts volume. Two sizes —capacities up to 75 tons per hour.



Newaygo Sand Gates—double undercut type. Tight seal. Available for all bins and hoppers. Geared for easy operation. Hand, counterweight or air operated.

MANUFACTURER'S ASSOCIATION INC. FOUNDRY EQUIPMENT

NEWAYGO ENGINEERING CO.

NEWAYGO, MICHIGAN

THE New Way LINE

Sand handling, cooling and conditioning equipment, mold conveying systems, reclaiming units, rapless core drawing machines.

REPRESENTATIVES IN PRINCIPAL CITIES

Greater Service to Fork-Truck Users

Greater Opportunities for Men Who Sell Them—

Clark Dealer Plan Achieves Both

WITH sales of its fork-lift trucks and industrial towing tractors exceeding all expectations, and with its position of production and engineering leadership firmly rooted in rich, productive soil, Clark Equipment Company, in its 30th year as a builder of materials-handling machines, has found it desirable to establish a nation-wide organization of independent franchised dealers as exclusive distributors of the products of its Industrial Truck Division.

THIS is indeed a far cry from 1939 when the entire output of the Industrial Truck Division was sold with ease by a handful of men!

TODAY'S volume is twenty times that of 1939; and the Company's stature—financial and engineering—is more than twenty times as great as in 1939. A considerable number of the '39 machines are in daily service, and many older machines are in regular operation after 20 and 25 years. The conviction is natural that 30 years hence many '49 machines will still be "on the job" alongside the new output of 1979. There will be no "orphans" bearing the name "Clark."

TO KEEP PACE with increasing demands, and to deliver the broad and competent service which Industry expects from Clark, the Company has chosen this plan of selling through independent dealers as a sound and logical evolution. Until the middle of 1948, approximately one-third of Clark's Industrial Truck Division representatives were on an independent dealer basis. It is expected that by the end of 1949 the nation-wide dealer organization will be complete.

HEADING up the dealerships or actively participating in them are key men of Clark's erstwhile factory-branch sales offices —factory-trained men, tested and proved as capable materials-handling counselors. These men share with Clark management the conviction that they can deliver, under the new plan, a broader and more valuable service to their customers and to all users of mechanized materials-handling; that they face broader, deeper vistas of opportunities which ambitious men so earnestly desire—opportunities for independence, for building greater earnings by their own efforts, for achieving prestige and leadership in their communities.

ANOTHER influence which furthered the plan is the fact that Clark management historically has been engineers and manufacturers. By decentralizing marketing activities, Clark can intensify its emphasis on development of better materials-handling machines and methods—to the end that Clark products shall achieve even higher excellence at lower cost, shall become still more valuable to industrial users and to the dealers who serve them.

THROUGH your Clark dealer, all the advantages of Clark engineering, integrated production and matchless experience are quickly available to you. He is fully qualified to make an unbiased appraisal of your materials-handling operations, and to recommend the type of machine that will serve you most efficiently at lowest cost. It's "good business" to CONSULT CLARK.

CLARK EQUIPMENT COMPANY

INDUSTRIAL TRUCK DIVISION

BATTLE CREEK 16, MICHIGAN

OTHER PLANTS—BUCHANAN • JACKSON • BERRIEN SPRINGS, MICHIGAN

REPRESENTATIVES IN PRINCIPAL CITIES THROUGHOUT THE WORLD

AUTHORIZED CLARK DEALERS

ALABAMA: BIRMINGHAM
*M-H EQUIPMENT COMPANY
845 LOMB AVENUE

ARIZONA: PHOENIX
ROBERT H. BRAUN COMPANY
743 GRAND AVENUE

ARKANSAS: LITTLE ROCK
FRED J. VANDEMARK COMPANY
209 EAST MARKAM STREET

CALIFORNIA: FRESNO 1
ROBERT H. BRAUN COMPANY
505 MASON BUILDING

LOS ANGELES 23
*ROBERT H. BRAUN COMPANY
3008 EAST OLYMPIC BLVD.

OAKLAND 3
*GLEN L. CODMAN COMPANY
10521 PEARMAIN STREET

SAN DIEGO
ROBERT H. BRAUN COMPANY
3872 FIFTH AVENUE

STOCKTON
GLEN L. CODMAN COMPANY
409 BELDING BUILDING

COLORADO: DENVER 2
*J. N. MEADE
420 U. S. NATIONAL BANK
Service: FORK LIFT TRUCK SERVICE
2855 WEST 8TH AVENUE

CONNECTICUT: NEW HAVEN
*C. E. REUTTER CORPORATION
66 AMITY ROAD

FLORIDA: TAMPA
CLARK EQUIPMENT COMPANY
1145 ELLAMAE STREET

ILLINOIS: CHICAGO 4
*MODERN HANDLING EQUIP., INC.
310 SOUTH MICHIGAN AVENUE
(*Service: Cook County*)
LIFT TRUCK SERVICE COMPANY
6919 SOUTH HALSTED STREET

INDIANA: INDIANAPOLIS 5
*W. A. MARSCHKE & SONS
1121 E. 46TH STREET

SOUTH BEND 14
*MATERIALS HANDLING EQUIP. CO. OF SOUTH BEND, IND.
2625 SOUTH MICHIGAN STREET

IOWA: DAVENPORT
*BIG RIVER EQUIPMENT CO.
1344 WEST THIRD STREET

DES MOINES
*BIG RIVER EQUIPMENT CO.
914 GRAND AVENUE, ROOM 255

KANSAS: KANSAS CITY
Sales and Service:
(SEE KANSAS CITY, MISSOURI)

LOUISIANA: NEW ORLEANS
T. G. FRAZEE
910 CARONDELET BLDG.

MAINE: PORTLAND
BRODIE INDUSTRIAL TRUCKS, INC.
(CONTACT MALDEN, MASS.

MARYLAND: BALTIMORE
FALLSWAY SPRING & EQUIPMENT CO.
CORNER FALLSWAY & LEXINGTON

MASSACHUSETTS: BOSTON (MALDEN 48)
*BRODIE INDUSTRIAL TRUCKS, INC.
50 COMMERCIAL STREET, MALDEN 48

MICHIGAN: BATTLE CREEK
CLARK EQUIPMENT COMPANY
INDUSTRIAL TRUCK DIV. PLANT

DETROIT 2
*CLARK EQUIPMENT COMPANY
6520 CASS AVENUE
Service: INDUSTRIAL TRUCK SERVICE, INC.
8815 HARPER AVENUE

MINNESOTA: MINNEAPOLIS 2
*MATERIAL HANDLING ENGINEERS
225 SOUTH 5TH STREET, ROOM 201
Service: SMITH-DUNN COMPANY, INC.
2301 UNIVERSITY AVENUE, S. E.

MISSOURI: KANSAS CITY 6
*CLARK EQUIPMENT COMPANY
1009 BALTIMORE AVENUE
Service:
LIFT TRUCK SERVICE & SUPPLY
NORTHWEST 13TH AND McGEE STREETS

ST. LOUIS 8
*MATERIALS HANDLING EQUIPMENT CORP.
3820 WASHINGTON BLVD.
Service:
FORK LIFT TRUCK SERVICE CO.
511 CHANNING STREET

AUTHORIZED CLARK DEALERS

NEW JERSEY: JERSEY CITY
*JERSEY INDUSTRIAL TRUCKS, INC.
34 EXCHANGE PLACE
Service:
BOND INDUSTRIAL MAINTENANCE CO.
51 CLARKSON STREET AT GREENWICH
NEW YORK 14, NEW YORK

NEW YORK: BUFFALO
*BRODIE INDUSTRIAL TRUCKS INC.
1450 MICHIGAN AVENUE
NEW YORK 6
*BOND INDUSTRIAL EQUIPMENT CO.
165 BROADWAY, ROOM 2200 (OFFICE)
Service and Display Room:
51 CLARKSON STREET AT GREENWICH
NEW YORK 14—also
289 BOND STREET, BROOKLYN 31
SYRACUSE
BRODIE INDUSTRIAL TRUCKS INC.
712 STATE TOWER BLDG.
ALBANY (WATERVLIET)
*INDUSTRIAL TRUCK SALES, INC.
BROADWAY AT 25TH, WATERVLIET

NORTH CAROLINA: GREENSBORO
Service Outlet only:
INDUSTRIAL TRUCK SERVICE CORP.
629 SOUTH SPRING STREET

OHIO: CINCINNATI
ROBERT C. YOUNG, P. O. BOX 96
CLEVELAND
CLARK EQUIPMENT COMPANY
522 ROCKEFELLER BLDG.
TOLEDO 10
PERCIVAL L. REYNOLDS, 2558 FULTON STREET

OKLAHOMA: TULSA
ARST EQUIPMENT COMPANY
34 NORTH MADISON

OREGON: EUGENE
PRESTON FALLER COMPANY
891 TAYLOR STREET
PORTLAND 5
PRESTON FALLER COMPANY
1220 S. W. MORRISON STREET

PENNSYLVANIA: PHILADELPHIA 8
*CLARK EQUIPMENT COMPANY
401 NORTH BROAD STREET
Service:
PHILADELPHIA ENGINE REBUILDERS, INC.
330 WEST QUEENS LANE
PITTSBURGH
*MATERIAL HANDLING INCORPORATED
319 THIRD AVENUE

SOUTH DAKOTA: SIOUX FALLS
CENTURY EQUIPMENT & SUPPLY CO.
22 WEST 7TH STREET

TENNESSEE: MEMPHIS 3
*FRED J. VANDEMARK COMPANY
1110 UNION AVENUE

TEXAS: DALLAS
*T. G. FRAZEE
1012 FIRST NATIONAL BANK BLDG.
Service:
TRUCK EQUIPMENT COMPANY
2409 COMMERCE STREET
HOUSTON
*T. G. FRAZEE, 810 PETROLEUM BLDG.

UTAH: SALT LAKE CITY
A. J. ISAACSEN, JR.
45 SOUTH 3RD WEST STREET

VIRGINIA: NORFOLK
*McLEAN-SHAND, INC.
955 WEST 21ST STREET

WASHINGTON: SEATTLE 1
*PRESTON FALLER COMPANY
1921 MINOR AVENUE
SPOKANE 9
PRESTON FALLER COMPANY
EAST 41 GRAY AVENUE

WISCONSIN: MILWAUKEE 2
*CLARK EQUIPMENT COMPANY
759 NORTH MILWAUKEE AVENUE, ROOM 623
Service: LIFT TRUCK SERVICE CO.
5710 WEST NATIONAL AVENUE

DISTRICT OF COLUMBIA: WASHINGTON
CLARK EQUIPMENT COMPANY
927 15TH STREET N. W.

TERRITORY OF HAWAII: HONOLULU
*PRESSED STEEL CAR COMPANY
538 REED LANE, P. O. BOX 300

*Sales and Service.

For Names and Addresses of Export Distributors, write to: Export Division, Clark Equipment Co., Battle Creek, Mich., U.S.A.

(*Continued from page 230*)

The mold wash used in the several examples illustrated, consisted of the following mixture: 50 grams finely powdered tellurium metal, 200 grams silica smoke, ½-pint commercial alcohol. Brushing of the wash was used to coat the core or mold surface, but spraying would be much more effective both as regards insuring uniformity of coating and maintaining good suspension of the powders.

The wash was restricted to a few teeth of the 7-in. diameter gear cast in core. The result is illustrated in Fig. 8, which shows the absence of any chill on the three teeth on the right of the photograph where the wash was omitted. The other teeth, which were poured into mold cavities brushed with the tellurium suspension, exhibit a thin continuous surface chill. A direct view of two teeth fractured from the wheel is illustrated in Fig. 9. The tooth to the left was untreated and that to the right resulted from a tellurium wash on the core section forming this particular tooth.

Fig. 10 illustrates a typical controlled chill obtained in a car wheel as depicted by the appearance of the fracture.

The promotion of a chill on the teeth of a sprocket cast in core is shown in Fig. 11.

High Tensile Iron—Two examples will be used to demonstrate the reaction of a high-strength iron to the promotion of general chill by ladle addition and to local chill by use of the tellurium-silica-alcohol suspension used as a core wash.

L-chills, ¾-in. were cast from three ladles of the same metal untreated and modified with 0.005 and 0.01 per cent tellurium as ladle additions. The reaction of a steel chill to the untreated metal is shown on the polished etched cross section of the casting (Fig. 14-A). The effect of progressive increments in tellurium treatment is indicated in Figs. 14-B and 14-C. The maximum hardness was similar for all test specimens and showed 48.5 to 49.5 Rockwell "C".

In the second example, castings were poured into core and into green sand after the application of a tellurium wash to selected parts of the mold. The 7-in. gear, previously illustrated in Fig. 8 was cast in core. Teeth were fractured from sections of the casting in which the wash had been omitted and in which the mold cavity had been brushed with the tellurium suspension. Difficulty in breaking the individual teeth resulted in a fracture occurring at an angle of about 45° to the face of the body of the gear. However, Fig. 12 demonstrates the effective chill produced by the wash (Fig. 12-B) as compared with the plain core (Fig. 12-A).

A sprocket was also cast in core and a wedge shaped casting poured in green sand. The picture-frame chill resulting from a tellurium wash is shown in a photograph of the fractures (Fig. 15).

The readily induced chill obtained with tellurium treatment in this type metal was further demonstrated by casting a 1-in. thick plate on an open green sand mold to which 5 per cent tellurium powder was added in the facing sand. The fracture was completely white.

Soft Gray Iron—A regular foundry soft gray iron is much less susceptible to chill than either a high tensile iron or a wheel iron in which the high carbon and low silicon are controlled primarily for promoting more ready reaction to chill.

The discussion and illustrations include an examination of the effect of ladle additions of tellurium wash and of a facing core or green sand impregnated with powdered tellurium metal.

Very small amounts of tellurium addition are relatively ineffective with a soft gray iron, as shown in Figs. 16A and 16B. For these specimens the untreated iron and a ladle of iron treated with only 0.005 per cent tellurium were poured as L-chills onto a steel plate. The polished and etched fractures show the

TABLE I—Bhn Range in Gray Iron

Tellurium Addition, %	Brinell Hardness Corner	Center
Nil	207	207
0.0025	370	370
0.005	437	437
0.025	437	437
0.050	437	437
0.10	437	437
0.2	415	415
1.0	415	430

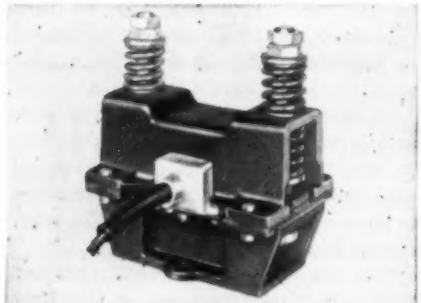
TABLE II—Effect on Bhn Along Diagonal of Fractured 6-in. Block

	High Tensile Iron X			Medium Tensile Iron Y			Low Tensile Iron Z		
Number*	A	B	C	A	B	C	A	B	C
1	415	514	514	477	477	514	229	241	302
2	415	514	514	477	477	555	179	197	229
3	415	514	551	477	477	514	179	179	197
4	388	388	409	409	415	415	143	153	179

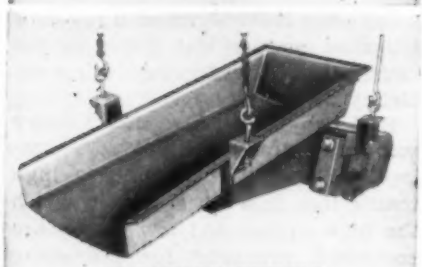
* Numbers indicate successive ½-in. traverses along a diagonal. Tellurium additions were 0.025 per cent for A, 0.05 per cent for B, 0.1 per cent for C.

SYNTRON

Speeds Up Bulk Material Handling —at Reduced Costs!



BIN VIBRATORS
Make Stubborn Materials Flow Freely



VIBRATORY FEEDERS
Up to Hundreds of Tons per Hour — Rheostat Control of Flow

VIBRATING GRIZZLIES
Both Feed and Scalp With One Unit

VIBRATING SCREENS
Wet or Dry — Single or Multiple Decks

PLUS—

Long Conveyors
Batching Systems
Hopper Level Switches

Write for literature

SYNTRON CO.
540 Lexington, Homer City, Pa.

slight effect of tellurium (Fig. 16-B), the depth of chill being increased from about 7/64-in. to a full 10/64-in.

When the regular soft iron was cast into an open green sand mold of 1-in. square section no chill of course was noted. However, impregnating the facing sand on the bottom of the mold with 5 and 10 per cent tellurium a definite localized chill resulted (Figs. 16-C and 16-D, respectively).

The effect of increasing the amounts of tellurium added to the ladle is shown in the ground polished and etched fracture from L-chills containing 0.01, 0.05 and 0.1 per cent tellurium (Figs. 13-A, B, C). The depth of chill obtained was 3/32, 20/32 and 22/32 in., respectively. The tendency to picture-frame is also evident.

Processing the metal with 0.1 per cent tellurium is also effective in promoting chills in wedge-shaped castings poured into green sand. The appearance of the fracture of part of a casting is reproduced in Fig. 17.

The development of a thin chill on the surface of a sprocket poured into a core with a tellurium wash is illustrated in Fig. 18.

A more specific control as to degree and location of chill can be obtained by impregnating the facing sand used in a core. This procedure, however, is more effective when used with a stronger iron having a little improved tendency to chill. Impregnation with ½ per cent tellurium is quite effective, however, as shown in Fig. 19. It is important that the metal be poured hot in order to get the full chilling effect of the impregnation.

Employees Receive Service Awards

Waukesha Foundry Co. recently held its third annual service award party at the VFW clubhouse, Waukesha, Wis., with employees, wives and husbands present. Gold watches were awarded by C. C. Smith, president, to Henry Badciong, James Congemi, Harry Dallman and Charles Schultz for completing 25 years of service. In addition they received service pins awarded by Roy Cairns, vice president and general manager. Pins also were awarded to employees with 5, 10, 15 and 20 years service.

John Wegner and Harold Price received Wisconsin State Industrial Commission diplomas for completing their regular 4-year apprenticeship course. Mr. Wegner completed a foundry apprenticeship and Mr. Price is now a journeyman patternmaker.

Graphitization

(*Continued from page* 95)

nadium, and excess sulphur in the amounts studied seriously retarded second stage graphitization, bismuth, molybdenum, tin, excess manganese, tellurium and tungsten to a lesser but still noticeable extent. First stage graphitization was seriously affected by 0.08 per cent boron, although the amount had practically no effect on the second stage.

Additions of small amounts of ferrosilicon immediately prior to casting increases the nodule number. If the addition is made at an earlier stage in the melt, no apparent increase is observed.

The above brief comments on residual elements[13] have been deliberately included because the basic materials available to industry at the present time are known to be contaminated with small percentages of these elements.

These percentages, although rarely affecting the malleable produced in the usual lengthy annealing cycles, will seriously interfere with any attempts to reduce the annealing times by the use of modern annealing ovens.

Effect of Gases — Hydrogen either present in the white cast irons or in the gas phase present in the annealing operation is known to have a pronounced effect on graphitization.[14]

It is possible that a slow rate of heating has an appreciable effect on the quantity and distribution of the hydrogen present in the white cast iron, and, therefore, upon subsequent nucleization.

Experiments carried out by the author, on compositions containing the sulphur as manganese sulphide, have indicated that 30-35 nodules per unit area are obtained when annealing is carried out in a CO/CO_2 gas atmosphere, as against 2-3 nodules per unit area for the same base material annealed in burnt town's gas containing hydrogen.

A further interesting phenomena has been demonstrated by Bernstein[15] —samples of white cast iron were annealed in perfectly dry hydrogen. Micro-examination showed that very little decarburization had taken place, and although carbon had diffused from the center toward the surface, it had not been removed. At the extreme edge of the specimen, a thin

layer of ferrite was found to contain a concentrated layer of flake graphite. Fig. 15 shows an example of this structure.

Further experiments confirmed the foregoing and indicated that the very limited decarburizing effect of pure dry hydrogen was profoundly increased by the presence of water vapor. The structures obtained after annealing in hydrogen plus water vapor atmospheres were more typical of normal whiteheart practice and were without the surface layer of ferrite and flake graphite.

Influence of the Melting Operation—The products of combustion during the melting of white cast iron are also believed to influence the number of nodules produced during annealing.[16]

It may not be without significance that the majority of high grade malleable produced in America is made in air-furnaces. In these furnaces, the iron is subject to progressive oxidation over comparatively long periods. The author, using oil-fired rotary furnaces capable of a fast melting rate, has obtained a high degree of control by the use of special burners and positive oil and air control.

It is thus possible to melt cast iron with a minimum of oxidation. Such iron appears to mottle more easily, and to produce fewer nodules when annealed, than iron of the same composition produced under more oxidizing conditions. Other investigators have suggested that melting in arc furnaces under reducing conditions decreases the number of nodules formed during annealing. Reduction in nodule number is also found if basic instead of acid linings are used. An increase in nodule number is usually obtained as the percentage pig iron charged is increased, due, possibly, to the increased amount of graphite charged. High steel scrap content charges appear to graphitize less easily the higher the percentage, in spite of the similar compositions finally obtained.

Finally, there is the effect of the base pig iron or raw materials used in the melting operation. Figs. 22 through 25 illustrate typical differences in annealability obtained from the use of two brands of British hematite pig iron. The composition of the white iron obtained from the different brands was apparently identical; samples were annealed side by side in the same container. Figs. 22 and 23 show the result of annealing white iron made from pig iron "A", and Figs. 24 and 25 the results from similar compositions made from pig iron "B". Table I gives the complete analysis of the two samples.

SEMET-SOLVAY FOUNDRY COKE

CONTROLLED—SEMET-SOLVAY'S coke plants are equipped for quality production. Guesswork is eliminated, resulting in constant uniformity in the finished product. That is why, day in and day out, our foundry coke comes up to specifications – the specifications you have demanded.

SEMET-SOLVAY DIVISION
Allied Chemical & Dye Corporation
CINCINNATI • DETROIT • BUFFALO
In Canada: SEMET-SOLVAY COMPANY, LTD., TORONTO

for Better Melting

We can do a better job for less because We serve Foundry managements exclusively

What and Why—STANDARD DATA? Tables of time allowances for doing the elements of operation in your plant with your own methods, materials and equipment. With the aid of Standard Data a clerk can determine the time for making a core, a mold or cleaning a casting. The time determined will be the same today or tomorrow and will be consistent with all comparable jobs. Standard Data is the best basis to be used in determining the selling price of a job, for keeping costs low and in line. Our cost of STANDARD DATA for your operations is low, a quotation of total cost to you will be made on a single operation or plant wide coverage without obligation.

Westover ENGINEERS
FOUNDRY MANAGEMENT CONSULTANTS
424 E. WELLS STREET PHONE BROADWAY 6401
MILWAUKEE 2, WISCONSIN

JOB EVALUATION, STANDARD DATA, PRODUCTION CONTROL, STANDARD COSTING, FOUNDRY ACCOUNTING, JOB COST ESTIMATING

ONLY A

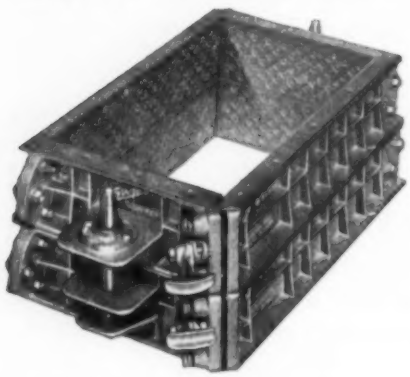
Stripper

(PATENTED)

MECHANICAL

FLASK

Can give you these important features...



★ FAST-ACTING SURE-GRIP CAM

★ STURDY *DUAL* SPRING DESIGN—FASTER ACTION, LONGER LIFE!

★ EITHER 4° or 5° TAPER

★ "OCTO-GRIP" DESIGN REALLY HOLDS SAND—NO LOST COPES!

★ REPLACEABLE STEEL WEAR STRIPS FOR LONGER SERVICE LIFE!

Here's an *improved* mechanical flask... with all the practical features that step up production and cut costs. Rugged yet light in weight, these precision-made aluminum flasks handle easier with less fatigue. They're precision-aligned, yet draw smoothly and quickly. And they're built to take roughest foundry usage without trouble—day after day, year after year.

STRIPPER flasks and jackets can be supplied promptly to any dimensions that best suit your requirements. Special shapes can also be supplied on order.

● ***THE FACTS are yours for the asking. Ask your local supply house, or write today for literature...or for prices and delivery information on your particular requirements.***

General Foundry Service Corporation

516-23rd Avenue

OAKLAND 6, CALIFORNIA

Space does not permit of fuller explanation, already reported in a previous paper[6], but the difference in annealability is very obvious. The examples shown are not a unique occurrence but can be repeated whenever these brands of pig iron are used.

This is a most teasing problem which has so far baffled the author and many eminent metallurgists to whom he has appealed for help.

Speed of Graphitizing Reaction—Consideration of previous data emphasizes the complexity of the graphitizing reaction, which is regarded as involving the formation or activation of neuclei upon which graphite can form, the solution of cementite in iron, its dissociation into the elements iron and carbon, the diffusion of carbon either before or after dissociation, and the crystallization of graphite. The speed of the reaction must be controlled by the slowest of the above processes. Schwartz teaches that the rate is determined in the beginning by the crystallization velocity of graphite, followed by the solution rate of cementite. After the initial deposition of graphite, the process as a whole is controlled by the diffusion of carbon and is, perhaps, finally governed by the rate of decomposition of the carbide.

The above reasoning is generally accepted but does not explain the influence of certain elements known to decrease the rate of diffusion in austenite. Silicon, manganese and chromium decrease the diffusion rate. Silicon accelerates graphitization; manganese and chromium are retarders. Sulphur is also a retarder of graphitization, and in this case it seems that the solution rate of cementite controls the velocity of the reaction.

Second Stage Graphitization — At any temperature above A_1, the graphitizing reaction ceases when equilibrium is reached, the structure consisting of graphite and gamma iron solution. Cooling from this stage to a temperature just above the critical range can be carried out comparatively quickly in the case of the balanced manganese sulphur compositions.

If, however, large excesses of sulphur are present, or excesses of manganese in combination with low silicon contents, cooling to just above the critical range must be slow to avoid deposition of the excess carbon as a cementite network.

Our knowledge of the effects of cooling to and through the critical range is very inadequate in the case of compositions containing free iron sulphide and by no means complete for compositions containing manganese sulphide in great or small amount.

Little attempt is made in the production of whiteheart malleable to control the cooling rate; the mass effect of the oven and its contents is usually allowed to govern. As a result, structures containing a network of cementite at the grain boundaries, associated with pearlite in a very coarse and abnormally divorced form, are far too often obtained.

Such structures possess very inferior mechanical properties. Because no ferrite forms around the spherulites, we have been content to assume that rate of cooling is unimportant.

The author believes this to be untrue and suggests that slower rates of cooling to and through the critical range will materially alter the structure of the pearilte and improve the physical properties.

Graphitization in Two Stages

With regard to second stage graphitization in compositions containing sufficient manganese to balance the sulphur, Schwartz[17] has recently stressed the fact that it occurs in two stages:

1. The reaction occurring between the A_3 stable and A_1 metastable temperatures, in which austenite decomposes, the carbon being deposited onto the existing nodules.

2. The reaction occurring if the alloy at equilibrium above A_1 is cooled rather more quickly to just below the metastable A_1, when the remaining solid solution decomposes into alpha iron and cementite (i.e. pearlite).

If the temperature is then maintained just under the critical range, the cementite spheroidizes. The spheroids nearest to graphite nodules gradually reduce in size, and finally all cementite is eliminated by migration to, and deposition on, the graphite nodules.

Schwartz teaches that stage 1 is ten times as fast as the reaction above the critical range, and one hundred times as fast as stage 2. This surely implies that the diffusion rate of carbon in alpha iron is relatively slow and not as stated by Schwartz[17] in a recent paper, enormously rapid.

To take full advantage of the above facts it is necessary to know the effects of various residual elements on the temperature of the critical range. That manganese depresses and silicon elevates the critical range is well known, but perhaps not sufficiently recognized in practice.

At this stage, the author believes it convenient to review the fundamental data so far presented. It is

pertinent to ask, "How can such data be applied in practice?" The results of a technique developed in the foundry with which he is associated, may demonstrate some applications of these data.

Production is mainly of light section castings, demanding molten metal fluidity of a degree usually associated with the high carbon contents common to whiteheart practice. Such fluidity is necessary to avoid excessive foundry scrap in producing thin section castings. Many consumers, however, demand malleable castings of maximum machinability.

This demand has undoubtedly arisen as a result of experience with blackheart malleable cast iron, the structure of which—graphite nodules in a matrix of ferrite—allows of very high machining speeds.

The melting unit is an oil-fired rotary furnace. A carbon content of 3.1-3.2 per cent was found by experience to give sufficient metal fluidity without resorting to expensive superheating. With this carbon content it was found that silicon contents of 0.5-0.55 per cent were as high as could be tolerated if primary graphitization was to be avoided in the heavier sections. Sulphur contents from the rotary furnace were found to average just under 0.1 per cent. Manganese contents of 0.25-0.3 per cent were desired in order to completely graphitize the product during the annealing process.

Physical Properties Low

Observations over a number of years decided the choice of a particular hematite pig iron known to produce a white iron which would graphitize easily. Metal is tapped at 1430°C.

To commence with, the resultant product was annealed in an inert atmosphere. The annealing cycle consisted of a slow rate of heating to 950°C, a holding period at this temperature, followed by cooling to 720° C as fast as oven conditions would permit, then cooling at the rate of 2°C per hour to 650°C.

The material had the desired ferrite/graphite structure with little or no pearlite, and was found to be excellent from the angle of machining speeds. The physical properties, however, were agreed to be inadequate; tensile strength averaged 18.5-19.0 tons per sq in., elongation 8-10 per cent on 2 in., and bends of 30-40°.

The existing British specification (since revised) demanded on a 0.564-in. diam bar a minimum of 20 tons per sq in. for both blackheart and whiteheart with 7.5 per cent elongation for the former and 5 per cent

ENGINEERED BELTING CUTS COSTS 50%

Ten years ago an Eastern foundry tried and discarded four different types of conveyor belting. Extremely hot core sand made replacements frequent and expensive. An Imperial Belting engineer analyzed the operating conditions and recommended Imperial's INSULATED SAHARA, a belting manufactured especially for carrying hot, abrasive materials. Insulated SAHARA outlasted all belts previously tried by **2 to 1.** Since 1939 no other brand of belting has been used.

Unexcelled for Hot Materials

Made of 37½ ounce tight woven duck combined with asbestos and special insulating material and then impregnated, Insulated Sahara handles materials from 300° F. to 450° F.; Super-Insulated Sahara, from 450° F. to 600° F. Imperial's double-stitched, Inner-Locked construction positively prevents ply separation.

Imperial INNER-LOCKED BELTING

Engineered Belting— The Right Belt for Each Job

Write for Data Sheet 47-8 and prices.

IMPERIAL BELTING CO.

1755 S. Kilbourn Ave., Chicago 23, Ill.

HEAVY DUTY WHEELBARROWS AVAILABLE FOR PROMPT SHIPMENT!

You have been patiently waiting for Sterling Heavy Duty Wheelbarrows. Now, with a greatly improved material situation, we are in position to make prompt shipment on short notice. Sterling barrows are engineered for hard, everyday service. Phone, wire or mail your order — today.

Model S-5
Engineered to take hard punishment in industrial plants, railroads, foundries, etc.

Model 116A
Equipped with steel plate reinforcement for wheeling extra heavy loads in foundries, etc.

All Models equipped with either steel wheels or wheels having zero pressure tires or pneumatic tires.

STERLING WHEELBARROW CO., Milwaukee 14, Wis.

Look for this Mark of STERLING Quality

Sterling WHEELBARROWS

A 5621-1½

elongation for the latter. Bend values of 90° and 45°, respectively, were required around a radius of 1 in. from a bar 8 in. long, 1 in. wide and ⅜-in. thick.

It was obvious that the high graphite content was responsible for the inferior tensile strength and ductility. Further reference to American literature[18] revealed that decarburization has a favorable influence on strength and ductility, provided the formation of a pearlite rim can be avoided.

Also, previous observation had suggested that high bend values were not necessarily related to high elongation percentage, and could be produced if the surface layers were extensively decarburized. From these facts it was decided to combine the whiteheart and blackheart annealing practice.

An addition of 0.04 per cent aluminium was added to metal of the composition previously referred to, to encourage the rapid formation of graphite in the subsequent anneal. Castings were packed in a mixture of old and new hematite ore, heated slowly to 1000°C and held for 24 hours. The temperature was then allowed to fall slowly to 900°C over a period of 40 hours. Cooling to 720°C was again allowed to follow the natural cooling rate of the oven. Cooling from 720°C to 650°C required a somewhat longer time than in the previous annealing cycle to completely graphitize the impoverished surface layers. The results were entirely satisfactory.

Typical microstructures are shown in Figs. 26 and 27, and physical properties are given in Table II.

Bend values of 120° and over are easily obtained. When broken, the material has a black silky fracture, close inspection of which indicates the gradual increase in graphite content from surface to center. It is stressed that there is no steely rim typical of the so-called "picture frame" malleable. This material cannot be easily classified as either whiteheart or blackheart but does meet the special demands of certain consumers.

Another approach to the same problem would be to use a pig iron of the reverse graphitizing characteristics as the base for the production of white iron of similar analysis. Aluminum additions would be avoided, and a relatively fast rate of heating might ensure widely dispersed nodules. Periods of around 140 hours at 1000°C in a decarburizing atmosphere could be followed by relatively fast rates of cooling to and through the critical range. Such material has been produced and has extraordinary physical properties.

Tensile strength of 26 tons per sq in. is associated with elongation of the order of 16-20 per cent in 2 in. on 0.564-in. diam bars. The bend bars could be hammered over until a flat U bend was obtained, without signs of fracture. Examples of such material are shown in Figs. 28 and 29.

It is believed that these practical examples are sufficient to justify the presentation of the fundamental data on the graphitizing reaction.

To complete this paper reference should be made to the production of so-called pearlitic malleable cast iron and also to the gaseous descarburization of white cast iron. The former has been adequately dealt with elsewhere and the author would prefer to conclude with a necessarily brief reference to the latter.

Gaseous Decarburization of White Cast Iron — This process, developed in England during the war, was paralleled by a similar development in Germany. The principles underlying both developments were fundamentally identical, and have been fully reported.[19] The main difference in the practical application of these principles resulted in the development of batch type ovens in England and a continuous type in Germany.

The disadvantages of the iron ore process were obvious to Wust in 1908. He realized that by annealing white cast iron in iron ore, decarburization took place in the gaseous phase, and applied for a patent which covered a method of annealing in a mixture of carbon monoxide and carbon dioxide.

Since the war, several English malleable, ironfounders have installed special batch type ovens in which the gaseous atmosphere can be developed, circulated and controlled.

These installations have been highly successful for the production of relatively thin section castings in very short annealing periods, and their development is being watched with keen interest.

The high capital cost, fuel cost, and the necessity for much longer annealing periods in the case of medium and heavy section castings, has led to the opinion that rigid metallurgical control of the composition, coupled with greater knowledge of the decarburizing and graphitizing reactions in relation to various rates of heating and cooling, is necessary before these installations can successfully compete with the orthodox iron ore process.

The ovens are heated by electricity or radiant tubes. The decarburiz-

ALUMINUM
FOR PATTERNS, PLATES AND MATCHPLATES
USE
Trade LECTRO-PAT Mark
The Aluminum Alloy made especially for this exacting purpose. All standard and any special alloys are available.
THE CLEVELAND ELECTRO METALS CO.
CLEVELAND 13, OHIO
MEMBER—ALUMINUM RESEARCH INSTITUTE

1858 ★ ★ ★ 1949

91

YEARS

of Competent Lumber Service to Industry

but-

specializing in lumber for the pattern shop and the foundry

★

COMPLETE STOCKS OF

GENUINE NORTHERN WHITE PINE

CALIFORNIA SUGAR PINE

NORWAY PINE

HONDURAS MAHOGANY

Kiln Dried Super Thickness Rough or Dressed

Address all inquiries to Dept. "F"—or Wire or Phone your requirements at our expense.

RIETZ LUMBER CO.

1802-14 N. Central Park Ave.
Chicago 47

ing atmosphere is initially generated by the reaction between the entrapped air and the carbon from the surface of the castings, in a sealed chamber. This atmosphere is circulated and regenerated by the addition of more air as required. The introduction of small quantities of water vapor has been found to accelerate the reaction.

Conclusion—The complexity of the graphitizing reaction is evident from the above brief review. Most of the work which has been carried out on this reaction, until the last few years, has been limited to the type of iron used for the production of blackheart malleable. Schwartz has recently confirmed that there are many gaps in our knowledge even in this case.

With regard to the graphitizing and decarburizing reaction in connection with whiteheart malleable iron, our comprehension is even more limited.

There appears to be a need for the development of short-cycle malleable iron of consistent and adequate physical properties. Modern furnace builders can now supply furnaces capable of very close temperature control, and in which specially introduced atmospheres can be maintained and circulated.

Greater knowledge of the fundamentals governing the malleable iron process will enable the industry to use such furnaces economically and to produce the required short-cycle malleable iron.

More information is required on the physical properties of various types of malleable iron; for instance, fatigue, endurance, notch fatigue, shear strength, compression strength, impact resistance, modulus of elasticity must be ascertained and fully published to enable the modern engineer to make more use of such worthy material.

Acknowledgments — The author wishes to record his thanks to W. D. Bullows and J. F. Cooke for their interest and encouragement; also the British Cast Iron Research Association, and in particular, H. Morrogh, for their assistance and permission to publish some of the information given and for their help in connection with the micrograph.

Bibliography

9. H. G. Hall, "Malleable Cast Iron," Institute of British Foundrymen, *Proceedings*, 1946-47.
10. Schwartz, Johnson and Junge, "Graphitization of Pre-quenched White Cast Iron." American Society for Metals, Vol. 17. (1930).
11. Saito, "A New Phenomenon concerning the Graphitization of White Cast Iron and its Application to the Manufacture of Blackheart Malleable Castings," Memoirs of the College of Engineering, Kyoto. Imperial University, Vol. V. No. 1.
12. A. Hultgren and O. Edstrom, "Graphitization of Martensite on Heating." Jernkontorets, Annaler, 1942. Vol. 126, No. 3.
13. "The Influence of Raw Material on the

SCIENTIFIC · MATCH PLATES · Pressure Cast

Cope and Drag PLATES

SIZE . . .
Up to 61" x 79"

WEIGHT . .
Up to 800 lbs. per casting

- Multiple pattern Cope and Drag plates can be made from a single master pattern.
- Our system of "backing-out" assures uniform metal thickness.
- Our transfer points cast on the plates aid in pinning to the flasks.
- See our layout sheets for data required to build backing frames and position ribs and bolting bosses.
- Write us for quotations on your next Cope and Drag Castings.

The SCIENTIFIC CAST PRODUCTS *Corp.*

1390 EAST 40th STREET
CLEVELAND 3, OHIO

2520 WEST LAKE STREET
CHICAGO 12, ILLINOIS

PROPER DESIGN—
still the most
important ingredient

Despite the great advances in the use of alloy steels, the shape and proportions of a part are still of more vital significance than its material.

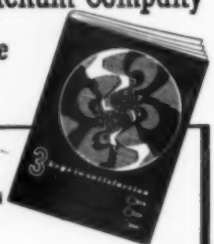
In an overall view, we should rate Design (1), the choice of the proper Steel (2), and its Treatment (3), in that order of importance. All are, of course, matters of great concern, but if the design is wrong then the proper choice of steel and its successful treatment serve no useful purpose.

What is the metallurgical significance of poor design? It promotes unhealthy stress concentrations and troublesome variations in the proportions of adjacent parts.

To stress the relationship of good design to metallurgical and economic factors, we have prepared a book helpful to designers, showing by sketches a great many factors in good and poor design which influence the behavior of a part in service.

Climax Molybdenum Company

500 Fifth Avenue
New York City



Please send your
FREE BOOKLET
3 KEYS TO SATISFACTION

Name.....
Position.....
Company.....
Address.....

F-7

Properties of Whiteheart Malleable Cast Iron with Special Reference to the Influence of Residual Elements." Institute of British Foundrymen, Paper No. 849, 1946.

14. Schwartz, Guiler and Barnett, "The Significance of Hydrogen in the Metallurgy of Malleable Cast Iron," *Transactions*, American Society for Metals, December, 1940. Also, Lorig and Samuels, "Effects of Hydrogen on the Time of Malleabilization." *Transactions*, American Foundrymen's Society, Vol. 50, 1942.

15. J. Bernstein, "The Annealing of Cast Iron in Hydrogen," *Journal*, Iron & Steel Institute, May, 1948.

16. A. L. Boegehold, "Factors Influencing Annealing of Malleable Iron," *Transactions*, American Foundrymen's Society, Vol. 46 (1938).

17. H. A. Schwartz, "Blackheart Malleable Iron, Solved and Unsolved Metallurgical Problems." Edward Williams Lecture to Institute of British Foundrymen, June, 1948.

18. *Cast Metals Handbook*, AFS, p. 309.

19. Wüst, German Patent No. 218307/1908. Baukloh and Foroud, "Archic für das Eisenhuttenwesen," 1943, V. 16, March, Robiette, *Proceedings*, Institute of British Foundrymen, 1944-45, Vol. 38, p.p. A90-A110. Jenkins and Williams, *Proceedings*, Institute of British Foundrymen, 1944-45, Vol. 38, p.p. A79-A89.

Effect of Magnesium on . . .

Aluminum—Copper—Silicon Casting Alloys

(*Concluded from page* 90)

with somewhat lowered impact resistance. If these same alloys contain as little as 0.2 to 0.4 per cent magnesium the improvement in strengths, etc. previously noted occurs, but with concurrent losses in impact strength up to 50 per cent of the original values (Figs. 3, 4, 5, 6).

Assuming that a certain minimum threshhold value for impact strength is desirable and considering that even the low magnesium (under 0.10 per cent) alloys do not possess outstanding properties in this respect, it seems that a word of caution is in order. For aluminum casting alloys with 3 to 5 per cent copper and with 3 to 9 per cent silicon, magnesium contents in the range of 0.15 to 0.5 per cent will reduce the impact strength as much as 50 per cent. Therefore the alloys with these magnesium contents should not be used in castings where occasional or accidental impact or shock loading is anticipated.

Test Specimens and Procedure—Numerous data on the effect of magnesium in various aluminum casting alloys have been gathered at the Central Research Laboratory of the American Smelting & Refining Company. Some are presented in this article to substantiate and elaborate upon the small amount of published information dealing with this subject. The high magnesium alloys investigated were produced by adding the desired quantity of magnesium to the initial low magnesium melts. The chemical analyses are given in Table I.

TABLE I—Analyses of Aluminum Alloys Tested (Figs. 3, 4, 5, 6)

Federated F460		Federated F480
3.65%	Copper	4.03%
5.75	Silicon	8.05
0.005 and 0.18	Magnesium	0.01 and 0.37
.90	Iron	.74
.73	Manganese	.36
.53	Zinc	.25
.05	Nickel	.39
.01	Titanium	.02
Balance	Aluminum	Balance

Both sand and permanent mold cast data are given. Separately cast-to-size tensile and Charpy impact specimens have been utilized for this work and the completely gated castings are shown in Figs. 1, 2, 7. The sand castings were poured at 1250° F and the chill castings at 1300° F.

Charpy impact specimens (10 x 10 mm) that could be tested in both the unnotched and notched conditions were produced so that some insight on notch sensitivity could be gained. The development of the sand cast impact specimens has been previously described.[2]

The permanent mold impact casting (Fig. 7) was also designed so that both types of Charpy specimens were available. The standard "V" notch was utilized and cast in, hence no machining was required on any of the specimens. In the chill casting the top half of each impact casting was used as the unnotched bar. Brinell hardness values were obtained using a 500-kg load and 10-mm ball for 30 seconds.

Summary and Conclusions—Based on the data plotted herewith, a number of conclusions can be drawn as to the effect of magnesium on the mechanical properties of aluminum casting alloys containing 3 to 5 per cent copper and 5 to 8 per cent silicon:

1. Magnesium higher than the commonly specified 0.05 to 0.1 per cent maximum increases the strength and hardness of both sand and chill castings. (Figs. 2, 4, 5, 6).

2. Marked attendant reductions in impact resistance and elongations are effected. (Figs. 3, 4, 5, 6).

3. These alloys age appreciably at room temperature, regardless of magnesium content. (Figs. 3, 4, 5).

4. Up to 50 per cent reduction in impact resistance occurs with magnesium in the 0.2 to 0.4 per cent range. Room temperature aging reduces these values still further. (Figs. 3, 4, 5).

5. A stabilizing or stress relieving heat treatment at 450° F results in more marked hardening and embrittlement when magnesium is present. Again, a loss in impact strength up to about 50 per cent is suffered. (Fig. 6).

References

1. W. E. Martin, "Secondary Aluminum for Sand Castings," *Transactions*, American Foundrymen's Society, Vol. 50, 1942, p. 766.

2. R. A. Quadt, "Cast-to-Size Impact Specimens for Aluminum Sand Casting Alloys," *Bulletin*, American Society for Testing Materials, August, 1945, p. 24.

Plan International Congress Program

The International Foundry Congress for 1949 will be held in Amsterdam, Netherlands, Aug. 29 through Sept. 2, under the auspices of the Netherlands Technical Foundry Association of which F. W. E. Spies is president. A. Baron Krayenhoff is president of the committee in charge of arrangements for the congress. An interesting program which includes technical sessions, plant visitations and social events has been arranged as well as sightseeing tours, luncheons and teas for the ladies in attendance. The building of the Royal Institute for the Indies will serve as headquarters where the technical congress opens at 10:30 Monday morning, Aug. 29, with a meeting there in the afternoon.

Plans for Tuesday include a choice of trips to Hengelo or Ulft and Doesburg. Foundries to be visited at Hengelo are those of the Koninklijke Machinefabriek Bebr. Stork & Co., which specializes in heavy gray iron castings; and N. V. G. Dikkers & Co., a steel foundry and machine shop. The second excursion includes a visit at the N. V. Diepenbrock & Reigers plant at Ulft, where gray iron castings for electro-technical industries, also bathtubs, etc., are produced; and a tour of the Ijzer-, Metaal-en Tempergieterij v.h. B. Ubbink & Co., Doesburg, also a gray iron foundry.

Wednesday's program features technical sessions in the morning with a visit in the afternoon to the Koninklijke Nederlandsche Hoogovens en Staalfabrieken N.V., a large iron and steel works having heavy plate, sheet and structural mills, and also a cast iron pipe foundry.

Thursday again is devoted to all-day excursions to see the foundry of Nederlandsche Staalfabrieken v.h. J. M. de Muinck Keizer, N.V. at Utrecht which produces heavy and small steel castings from open-hearth and electric furnaces; and Werkspoor N.V., Utrecht, a gray iron foundry producing heavy and medium size castings. An alternate trip that day is to N. V. Philips' Gloeilampenfabrieken at Eindhoven. Though this company maintains only a small foundry for special castings, the plant also manufactures electric bulbs, radio, x-ray and electronic equipment.

Following technical sessions Friday morning, a launch trip through the canals of Amsterdam with luncheon on board has been arranged. The banquet which concludes the congress will be held in the evening.

ERIE SINGLE LINE BUCKETS

ILLUSTRATED is the hook-on type, for intermittent service. It is reeved and ready for operation on overhead traveling crane, monorail hoist, locomotive crane, derrick, ships tackle or any other hoisting device which has but a single hoisting drum available for bucket duty. Just slip the yoke over the crane hook.

Erie Single Line buckets are also available in the direct-reeved type for permanent installation. Describe your Single Line bucket need — we'll give you our recommendations for we build all types and sizes.

● *Write for Booklet 402*

ERIE BUCKETS • *A Complete Line*

Erie Steel Construction Co., 1097 Geist Rd., Erie, Pa.

BUCKETS • AGGREMETERS • PORTABLE CONCRETE PLANTS

Now! More than ever before it's important to watch pattern costs!

CHECK Figures Below . . .

SEE HOW . . .

TAMASTONE

Saved $45.00 per day

REGULAR LOOSE MOLDING METHOD		SUPER TAMASTONE MACHINE MOLDING METHOD	
Loose molding labor $1.70 per hour 8 hours	$13.60	Machine molding labor $1.59 per hour 8 hours	$12.72
Casting weight, 5 pounds each 25 molds per day—125 pounds		Casting weight, 5 pounds each 125 molds per day—625 pounds	
125 pounds metal @ .20 lb.	25.00	625 pounds metal @ .20 lb.	135.00
Cleaning cost at .026 lb.	3.25	Cleaning cost at .026	16.25
Shrinkage 6%	1.50	Shrinkage 6%	8.10
	$43.35		$172.07
COST PER CASTING $1.73 PLUS		**COST PER CASTING $1.37 PLUS**	

36c PER CASTING SAVED OR $45.00 PER DAY, PLUS THE FACT THAT YOUR CUSTOMER RECEIVED PROMPT DELIVERY, BETTER CASTING DUE TO UNIFORM PARTING AND GATING.

Estimated Cost of Super Tamastone Match Plate:

16 pounds Super Tamastone @ .18	$2.88
1 hr. Molders time	1.70
1 hr. Cleaning	1.50
* Demountable Frame	11.50
	$17.58

* Frame should not be included as it can be used for other jobs.

TAMMS SILICA CO., 228 N. La Salle St., Chicago 1, Ill.

...TRADE PUBLICATIONS...

For More Details on these Items Use Reply Card—Page 219

CARBIDE TOOLS: Carboloy Inc., 11177 East Eight Mile Rd., Detroit 32—Manual 191 dealing with single point carbide tools presents data in a modified "slidefilm technique." A series of pictures runs through the text, each picture being placed next to the text it illustrates to "show how" as the text describes an operation. Sections are devoted to the latest approved recommendations on tool design, chip breaker design, grade and speed selection, brazing, tool grinding, chip breaker grinding, application of tools, trouble shooting, inspection of tools, and tool control and method selection.
For More Details Circle No. 90—Page 219

ABRASIVE BELT MACHINERY: Standard Electrical Tool Co., 2507 River Rd., Cincinnati 4—Bulletin 70 covering abrasive belt machinery describes bench and floor models with horizontal backstands, flexible horizontal-vertical backstands, individual wheel heads, various sizes of spring loaded and air cylinder backstands using from 6 to 20-in. diam contact wheels, and a variety of heavy duty polishers and grinders.
For More Details Circle No. 91—Page 219

NONFERROUS METALS: Revere Copper & Brass Inc., 6500 East Slauson Ave., Los Angeles—"Fundamental Characteristics of Revere Metals" is a nontechnical discussion of the basic technology of copper, brass and bronze. It deals with copper and its alloys; cold working and hardness; annealing, corrosion, and specifications.
For More Details Circle No. 92—Page 219

TRANSFORMERS: General Electric Co., Schenectady 5, N. Y.—Booklet GEA-4626B contains prices, ratings, and ASA accuracy classifications of the company's instrument transformers for both indoor and outdoor use. These include potential transformers, current transformers, metering outfits, and portable transformers.
For More Details Circle No. 93—Page 219

FACE SHIELD: Mine Safety Appliances Co., Braddock, Thomas & Meade Sts., Pittsburgh 8—Bulletin CN-2 contains full details on a nonflammable vinyl plastic face shield for protection of workers handling acids, chemicals, pouring metal, doing sanding, light grinding, degreasing, and other similar industrial operations.
For More Details Circle No. 94—Page 219

POWER JACKS: Duff-Norton Mfg. Co., 2709 Preble Ave., Pittsburgh 30 — Illustrated bulletin explains construction and safety features of air motor power jacks. Separate sections are devoted to specific applications and over-all specifications of the 20, 50 and 75 to 100-ton capacity jacks.
For More Details Circle No. 95—Page 219

METAL LETTERS: Nelson-Harkins Industries, 2023 North Damen Ave., Chicago 47—Brochure describes the company's service in creating, making and installing metal letters, plaques and neon signs. Charts show stock sizes of letters available in cast aluminum and bronze, fabricated stainless steel, and welded or porcelain enameled.
For More Details Circle No. 96—Page 219

RECIPROCATING FEEDERS: McLanahan & Stone Corp., Hollidaysburg, Pa.—Bulletin shows different applications for standard size reciprocating feeders. Each application, its functional advantages, and the feeder operation and drive in each case, are explained in detail and a feeder specification chart is included.
For More Details Circle No. 97—Page 219

AIR HOSE: New York Belting & Packing Co., One Market St., Passaic, N. J.—Booklet on air hose for welding, pneumatic tools and general air drill service gives data on the applications, construction and specifications for air hose and instructions for good air hose engineering practice.
For More Details Circle No. 98—Page 219

SILICA CEMENT: Chas. Taylor Sons Co., 710 Burns St., Cincinnati—Bulletin 507 describes the properties of a high-temperature silica cement and its application for bonding silica and super-duty silica refractories used in the construction of open-hearth, electric arc and glass melting furnaces.
For More Details Circle No. 99—Page 219

FLASKS: Black, Sivalls & Bryson Inc., Special Products Division, Section FF10, Power & Light Bldg., Kansas City 6, Mo.—Loose-leaf catalog contains complete descriptions, detailed drawings, photographs, and current prices of all styles of flasks, parts and accessories.
For More Details Circle No. 100—Page 219

SLING CHAINS: American Chain Division, American Chain & Cable Co., 929 Connecticut Ave., Bridgeport 2, Conn.—Catalog DH-80 lists advantages, specifications, description and working load limits of steel, iron and alloy sling chains. All attachments and their possible uses are charted for easy reference.
For More Details Circle No. 101—Page 219

WHEEL DRESSERS: Desmond-Stephan Mfg. Co., Urbana, O.—Wall chart measuring 9 x 12 in. illustrates and describes grinding wheel dressing tools. It is intended as an aid in selecting the proper dressing tool for various types and sizes of grinding wheels.
For More Details Circle No. 102—Page 219

PYROMETER ACCESSORIES: Bristol Co., Waterbury 91, Conn.—Bulletin P1238 contains detailed information on thermocouples, protection tubes, and other pyrometer accessories. A technical section contains engineering handbook data on such subjects as factors affecting thermocouple life, corrosion and poisoning, thermocouple reproducibility, thermocouple insulations, and information on selecting the correct thermocouple and protection tube for various applications.
For More Details Circle No. 103—Page 219

HYDRAULIC CELLS: Baldwin Locomotive Works, Testing Equipment Dept., Philadelphia 42—Bulletin 288 describes and illustrates hydraulic cells for general industrial weighing and special laboratory testing equipment. It also covers three self-contained, portable weighing units.
For More Details Circle No. 104—Page 219

ROLLER BEARING UNITS: Shafer Bearing Corp., P. O. Box 57, 801 Burlington Ave., Downers Grove, Ill.—Brochure describes and illustrates the company's self-aligning roller bearing units equipped with special bearing seals and adjustment locks.
For More Details Circle No. 105—Page 219

HYDRAULIC OILS: Swan-Finch Oil Corp., RCA Bldg. West, New York 20—Folder describes a series of hydraulic oils which have been developed recently to meet the demands of present day hydraulically operated industrial equipment.
For More Details Circle No. 106—Page 219

DYNAMOMETERS: W. C. Dillon & Co., 5410 West Harrison St., Chicago 44—Illustrated bulletin D describes and gives prices of the company's dynamometers — instruments for measuring traction, tension, or weight from 0-500 lb, to 0-20,000 lb.
For More Details Circle No. 107—Page 219

HOSE: American Ventilating Hose Co., 15 Park Row, New York 7—Catalog 30 deals with lightweight, strong, flexible, spiral wire reinforced hose specifically designed for dust collection, fume control and ventilation.
For More Details Circle No. 108—Page 219

BARREL STAND: Modern Equipment Co., 2007 Cuming St., Omaha, 2, Nebr.—Folder describes features of a portable barrel stand and explains its use with a series of sketches.
For More Details Circle No. 109—Page 219

LOADING DOCK RAMPS: Wayne Pump Co., Tecumseh St., Fort Wayne 4, Ind.—Folder describes hydraulic tilting loading dock ramps and truck lifts. It contains illustrations of various types.
For More Details Circle No. 110—Page 219

ROOF RESURFACERS: Stonhard Co., 1306 Spring Garden St., Philadelphia 23—Folder discusses plastic or liquid roof resurfacers for waterproofing tin, iron, concrete, slag, gravel, tar paper or felt roofs.
For More Details Circle No. 111—Page 219

BELT CONVEYORS: Barber-Greene Co., Aurora, Ill.—Bulletin illustrates details of the company's portable belt conveyors and shows typical applications of the equipment in industry.
For More Details Circle No. 112—Page 219

IT'S NEW—IT'S SENSATIONAL

AMASTEEL
TRUALLOY
SHOT

LASTS MANY TIMES LONGER

Here is the peak efficiency in shot for BLAST CLEANING and PEENING.

AMASTEEL is much better than hard iron or malleable abrasives.

Investigate AMASTEEL Shot today. It lasts six times as long!

Inquire about our complete testing facilities and get a report on operating efficiency and life of any abrasive shot offered to you. Data gladly furnished. Our tests will save you money.

PRODUCERS OF
PEENBLAST
CLEANBLAST
ALLOY 99

ALLOY METAL ABRASIVE CO.
311 WEST HURON ST. ANN ARBOR, MICH.

YOUR CASTING SALVAGE JOBS MAY NOT BE THIS DRAMATIC, BUT...

Read how NI-ROD came to the rescue of a badly broken block!

It looked like "curtains" for this cylinder block of a much-needed tractor motor.

Many shops might have scrapped it rather than have attempted to make repairs.

But this shop knew about Ni-Rod.*

They fitted the fractured parts together carefully. Then, with 1/8" Ni-Rod electrodes, they welded them securely in place.

Result: the motor block was restored to its original soundness, and the tractor was put back in service.

FOR NEW CASTINGS, TOO

Many foundries keep Ni-Rod handy to salvage defective castings. Such imperfections as porosity, blow-holes, underflush areas, and chill fractures are easily remedied with Ni-Rod.

Ni-Rod welds are strong, color-matching, and easily-machinable. Preheating is seldom necessary, slag removal is easy, and Ni-Rod gives you smooth bead contours. Experienced welders say: *"You can't beat Ni-Rod for strong, crack-free welds in cast iron!"*

Ni-Rod comes in 3/32", 1/8", 5/32", and 3/16" diameters. Order a five-pound package from your distributor—and see for yourself how easy it is to make on-the-spot casting repairs.

*Reg. U. S. Pat. Off.

EMBLEM OF SERVICE
INCO NI-ROD
TRADE MARK

FREE—new 8-page welding booklet. Mail the coupon! →

THE INTERNATIONAL NICKEL COMPANY, INC., 67 Wall St., New York 5, N. Y.

Mr. Jim Ryan
The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

Please mail my copy of: *"NI-ROD . . . a new electrode for any cast iron welding."*

Name_____

Company_____

TF-7-49

Address_____

City_____ Zone_____ State_____

Open your foundry roofs

...to the sky!

Install Swartwout *AIRMOVER* for large scale ventilation to remove heat, smoke, fumes

You can exhaust contaminated air by the AIR-MOVER *gravity* ventilation system when most of your foundry work rooms have no obstructions between floor and roof. This remarkably compact ventilator enables you to practically open your roofs to the sky, yet fully protects interior against the weather. It pays to make your foundry as comfortable and "livable" as possible . . . to attract workers and to get maximum production. *It pays to install efficient Swartwout Ventilation,* as many other foundries have done. Write for full information today *to*

THE SWARTWOUT CO., *18566 Euclid Ave., Cleveland 12, Ohio*

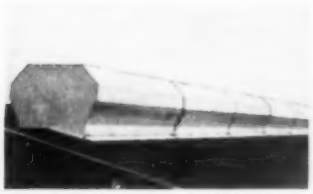
Excellent for Foundry Ventilation, too—

Swartwout-Dexter Heat Valve

Favorite ridge type ventilator known the world over. Another efficient type of gravity ventilator.

Swartwout Ject-O-Valve

Where conditions call for *force,* this powered type is Swartwout's answer for positive foundry ventilation.



Swartwout *Controlled* **Air Circulation**

EQUIPMENT FOR EFFECTIVE ECONOMICAL VENTILATION OF INDUSTRIAL BUILDINGS

HAMILTON SPRAY GUN

COMPLETE WITH 4½ FT. SUCTION HOSE AND SINKER

$10.00

F.O.B. HAMILTON, OHIO

For spraying molds and cores with any liquid. For cleaning electric motors, gasoline motors and machinery. For laying dust.

Neoprene disc valve. Trigger control. Sturdy brass construction. Length overall 6½". Weight without suction hose and sinker 18 oz. Two nozzle sizes, ⅛" and ¼". Literature on request.

GUARANTEED COMPRESSED AIR PRODUCTS

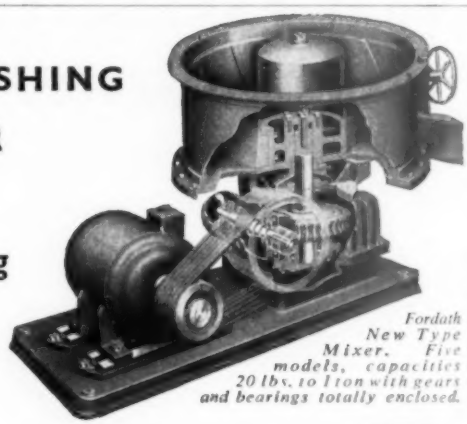
AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.

FIFTH AND VINE STREETS, HAMILTON, OHIO

Moisture Elimination Up To 3000 Pounds Per Square Inch

NO CRUSHING ANSWER to the sand-mixing question



Fordath New Type Mixer. Five models, capacities 20 lbs. to 1 ton with gears and bearings totally enclosed.

Makers of the famous GLYSO

TO MAKE an oil-sand mix for core work do not crush the sand, do not cause the grains merely to chase each other around the pan. Instead, fold and *rub* the sand and binding compound in a lively tumble so that each grain of sand is coated with a film of binder; so that capillary action can draw the oily GLYSO or EXOL to the areas of contact between all the grains throughout the batch of sand. Put your oil and sand into the swift, silent, efficient FORDATH NEW-TYPE MIXER wherein, between the rotating, curved blades and the fixed inclined ribs on the inner walls, a thorough, properly aerated charge of oil-sand is prepared; to be cleanly discharged after 2 to 3 minutes mixing.

NEW TYPE MIXER

FORDATH IN THE FOUNDRY

Full details from

THE FORDATH ENGINEERING CO. LTD.

Hamblet Works, West Bromwich, England

LADLES

ALL CAPACITIES • ALL TYPES

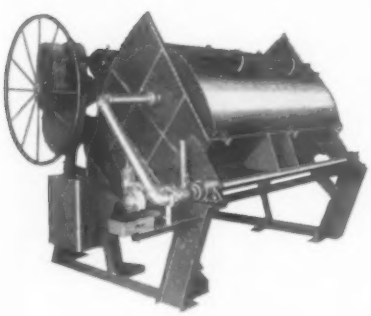
Including Timken worm geared Ladles with *Industrial's* patented distortion-proof, self-locking design

BOWLS

PRESSED STEEL
WELDED STEEL
RIVETED STEEL

Including

flat bottom, round bottom, and teapot spout types



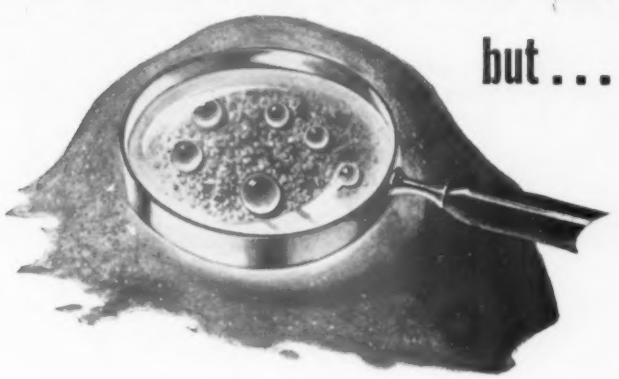
SPECIAL EQUIPMENT

Special geared motor-driven mixing ladle, an example of custom-build pouring and handling equipment available at INDUSTRIAL

SHANKS, TONGS, BAILS and CUPOLA EQUIPMENT in ALL TYPES

Coming—the new "DISTRIBUTOR". Watch for it!

THIS IS ORDINARY WATER AND SAND



but . . .

water treated with **COMPOUND M** wets sand

thoroughly . . . quickly . . . uniformly

Ordinary water has a tendency to form relatively strong and large drops which cling to surface sand and fail to penetrate. It is this principle which makes uniform wetting of sand difficult with plain water. But break or reduce the surface tension with Compound M and water penetrates rapidly right through to the bottom of the sand pile, *without flooding.*

The Compound M method of conditioning foundry sand means more efficient and lower cost production of ferrous and non-ferrous castings. Yet Compound M costs little to use.

COMPOUND M *CONTROLS DUST . . . MAKES WASHING EASIER AND QUICKER, TOO*

The same qualities of Compound M treated water which make it so valuable in conditioning foundry sand, also make it unusually useful in controlling foundry dust and washing foundry windows. Water treated with Compound M, covers a vastly greater area than ordinary water. It captures and holds dust in the air and on the ground or floor.

COMPOUND M

REG. U. S. PAT. OFF.

USE THIS COUPON

Johnson-March Corp.,
Drexel Bldg., Philadelphia 6, Pa.

Please send me at once your Bulletin F3 "Foundry Dust Control and Sand Conditioning".

Company Name.....

Address.....

.....

Your Name.....

THE JOHNSON-MARCH CORP.

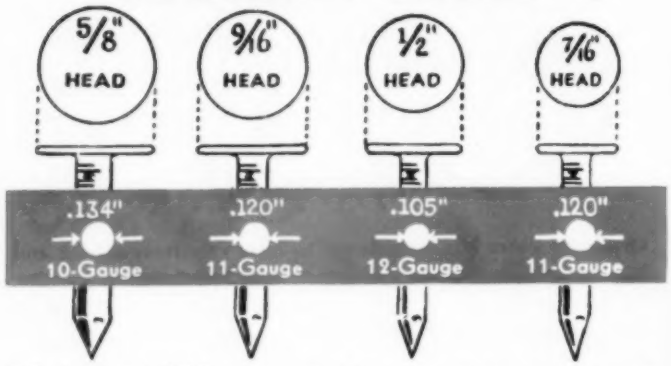
1724 CHESTNUT STREET,
PHILADELPHIA 3, PA.

compound M

For Foundry Sand Conditioning

ANGELL . . . PROVEN PRESSURE PROOF CHAPLETS

Producers of SUPER HEAD FOUNDRY NAILS



⅝", 9/16" & ½" Heads available up to 3 inches in length

Standard Foundry Nails available in all lengths.

All styles of Chaplets Accurately Made for Better Castings

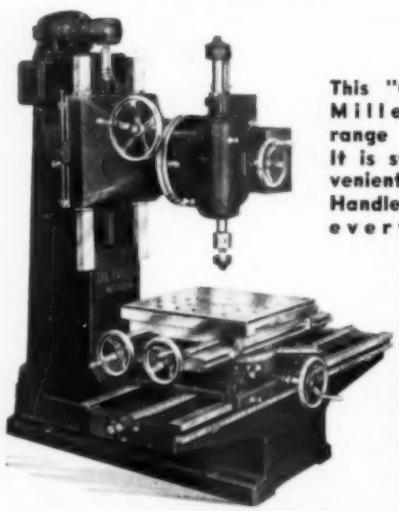
THE ANGELL NAIL & Chaplet Company
4580 East 71st Street
CLEVELAND 5, OHIO

"OLIVER"

No. 103 Universal

PATTERN MILLER

A Revolutionary Machine for both Wood and Soft Metals

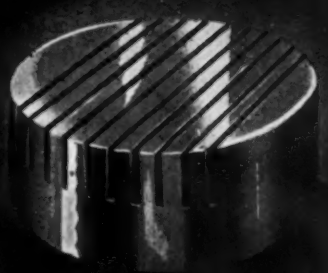


This "Oliver" Pattern Miller has unusual range and capacity. It is sturdy, and convenient to operate. Handles practically every operation in pattern making, including cutting core boxes, fillet cutting directly into pattern, and many intricate operations formerly requiring tedious hand work.

Write for Bulletin No. 103.

OLIVER MACHINERY COMPANY
GRAND RAPIDS 2, MICHIGAN

Precision



CORE BOX VENTS

Here's part of a complete line of DEMMLER core box vents—rigidly constructed in varying sizes of slotted brass—slotted steel—and screen mesh. Orders filled promptly from stock.

BRASS SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: ⅛", 3/16", ¼", 5/16", ⅜", 7/16", ½", ⅝", ¾", ⅞", 1", 1¼", 1½"

STEEL SLOTTED CORE BOX VENTS
Slot widths: .010", .013", .015"
Diameters: ⅛", 3/16", ¼", 5/16", ⅜", 7/16", ½", ⅝", ¾", ⅞", 1", 1¼", 1½"

SCREEN TYPE CORE BOX VENTS
Mesh: #30, #40, #50.
Diameters: ⅛", 3/16", ¼", 5/16", ⅜", 7/16", ½", ⅝", ¾", ⅞", 1", 1¼", 1½"

SPECIFICATION CIRCULAR ON REQUEST

Wm. DEMMLER & Bros.
Kewanee, Illinois

SHOT and GRIT... by AMERICAN STEEL

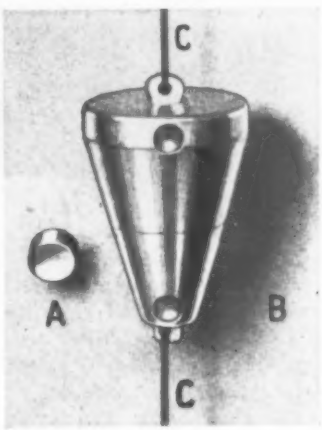
HERE'S HOW WE GIVE YOU FASTER, CHEAPER BLAST CLEANING
100 lbs AMERICAN SHOT
100 lbs AMERICAN GRIT
American Steel Shot and Grit give you top blast cleaning performance because American's own method of manufacture assures you of uniformity of size and hardness in every abrasive pellet. American abrasives last longer, clean faster, *never break apart*. You get maximum economy in your blast cleaning operations. American Shot and Grit is graded to all S.A.E. specifications . . . comes in 100-lb. bags.
MEMBER
FOUNDRY EQUIPMENT

The American Steel Abrasives Company

GALION, OHIO

BUY, RENT OR LEASE OUR RADIUM RADIOGRAPHY KIT

and make a short cut to more productive and economical foundry practice



The apparatus is as simple as
A—small radium capsule
B—cartridge container
C—rigid string support

The use of gamma rays in radiographing steel castings has increased by leaps and bounds since 1930, when the first commercial use of radiography was marked by a picture of the sternpost of the cruiser "Chester". Radium radiography is simple, economical and effective; because it may be rented or leased, the equipment doesn't require a capital investment. Because it is simple to operate, it doesn't require especially skilled operators. By 1948 200 steel foundries were renting or leasing radium from the Radium Chemical Co., Inc., and today radium radiography is rapidly approaching the status of standard equipment in progressive steel foundries. Photograph shows a simple method for radiographing a flange on a heavy steel casting. Let us tell you more about the simplicity and economy of radium radiography; write today for prices, terms and case histories.

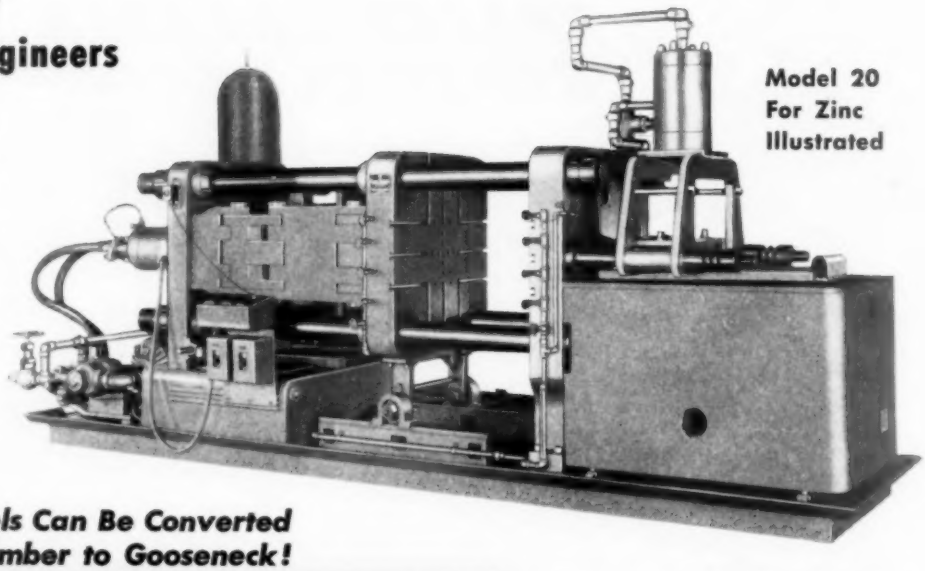
RADIUM CHEMICAL CO., INCORPORATED

570 LEXINGTON AVE., N. Y. (22) N. Y. CHICAGO: MARSHALL FIELD ANNEX BLDG.
3723 WILSHIRE BLVD., LOS ANGELES 5, CAL.

. . . Designed for Punishment
CAST-MASTER *Die Casting Machines*

Precision Built by Die Casting Engineers

● Cast-Master Die Casting Machines are designed and built by engineers with years of experience in the Die Casting Industry. Each model has been given months of actual operation under the most severe conditions. You'll find a CAST-MASTER geared for years of trouble-free operation plus high speed production at a minimum cost.



Model 20
For Zinc
Illustrated

All Cast-Master Models Can Be Converted From Cold Chamber to Gooseneck!

MILLER•TAYLOR TOOL CO.
5005 EUCLID AVENUE • CLEVELAND 3, OHIO

Send for New Catalog Showing Complete Line of Cast-Master Die-Casting Machines.

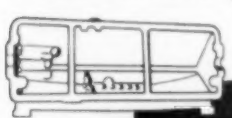
Casting Around
For Something In The Way Of A Casting...?

Then angle for one that's a lightweight

★ Like Well-Cast aluminum or magnesium castings... They're light (magnesium is 75% lighter—aluminum 35% lighter than iron). They're easy to machine. They're tough.

Well-Cast puts your product out in front with a modern metal... lightweight, featherweight.

We can show you new ways to put light metals to work on your product. 37 years of know-how. *Write for Catalog No. 47.*



Well-Made Patterns

THE WELLMAN BRONZE & ALUMINUM CO.

2502 EAST 93rd STREET • CLEVELAND 3, OHIO

PENN BUCKETS

No. 4-A
Self Dumping

Careful balancing makes Penn Buckets self dumping when loaded and self righting when empty. Welded construction prevents "clinging" makes them empty easily and completely.

MEMBER

WRITE TODAY FOR NEW BULLETIN DIMENSION SHEET AND PRICE LIST

PENN IRON WORKS
READING, PENNA.

★ Sharper Castings
★ Greater Brinell Hardness
★ Increase Tensile Strength
★ Increase Transverse Strength
★ Increase Wear Resistance
★ Increase Heat Resistance

Copper Shot

IMPROVES YOUR IRON

ALTER COMPANY Fifty Years of Service
1702 Rockingham Road, Davenport, Iowa

Sure Venting with Buffalo Brand VENT WAX

Just a few pennies worth of Buffalo Brand Vent Wax has saved many a casting from the scrap pile. Foundries rely on this time-proven product to provide safe, sure core vents when pouring even the most intricate castings.

Send for sample.

UNITED COMPOUND CO.
328 South Park Ave. Buffalo 3, N. Y.

SAVE TIME on Finishing Jobs

STOW
Models V40 & V50
½-¾ or 1 HP
FLEXIBLE SHAFT MACHINE

GRINDS ● FILES ● SANDS ● BUFFS
DRILLS ● WIRE BRUSHES ● POLISHES

Save job time — cut costs

PORTABLE tool goes to the job.

REQUIRES LESS MAINTENANCE. Overhead motor is safe from chips, filings, dust.

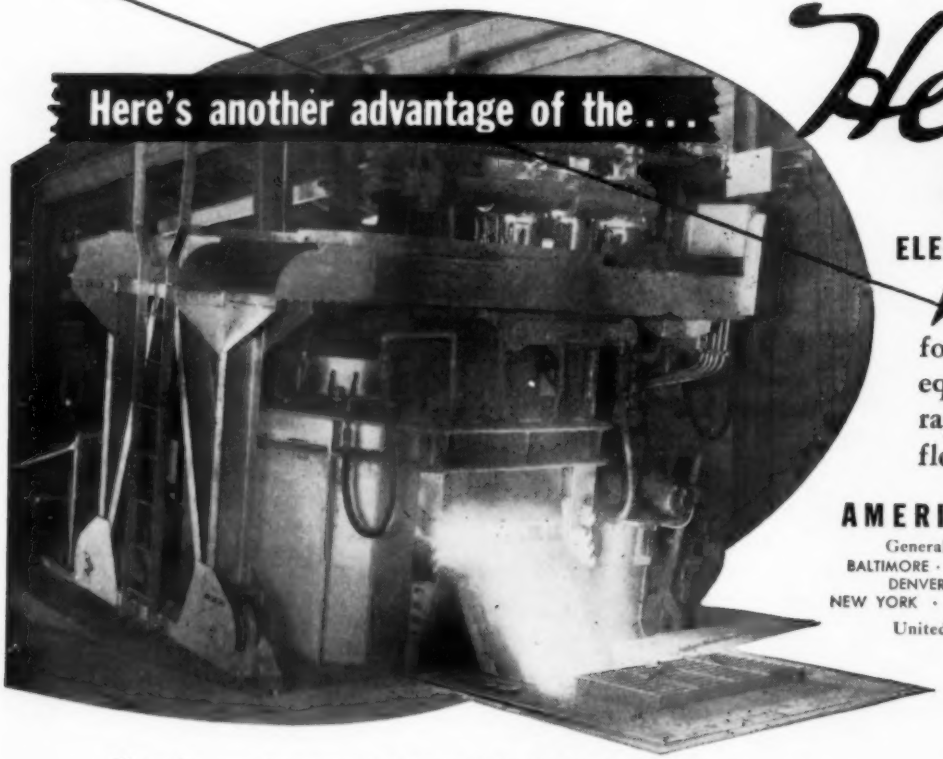
LESSENS OPERATOR FATIGUE. No heavy machine to lift or operate.

PERMITS UNOBSTRUCTED VIEW. Reaches hard-to-get-at places.

WRITE TODAY FOR FULL INFORMATION

Ideal for shops with limited room ...occupies no floor space.

STOW MANUFACTURING CO.
23 Shear St. Binghamton, N. Y.



Heroult

GANTRY-TYPE
ELECTRIC MELTING FURNACE

High powered transformers and modern control equipment are supplied for rapid melting, maximum flexibility and efficiency.

AMERICAN BRIDGE COMPANY

General Offices: *Frick Building, Pittsburgh, Pa.*
BALTIMORE · BOSTON · CHICAGO · CINCINNATI · CLEVELAND
DENVER · DETROIT · DULUTH · MINNEAPOLIS
NEW YORK · PHILADELPHIA · ST. LOUIS · SAN FRANCISCO
United States Steel Export Company, New York

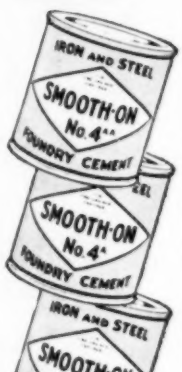
Write for your free copy of the new Heroult Catalog.

AMERICAN BRIDGE COMPANY · USS Heroult FURNACES · UNITED STATES STEEL

UNITED STATES STEEL

3 Shades
FOR A CLOSE MATCH with YOUR castings

When you true up surface blemishes in castings with Smooth-On No. 4 Foundry Cement, you can make a close match in color and texture. For light colored, fine grained castings use Smooth-On No. 4AA, which will also take a machined finish. For medium gray metal choose No. 4A. For dark gray, coarser grained pieces you'll find Smooth-On No. 4B a match. Experienced foundrymen use Smooth-On Foundry Cements regularly to fill in harmless but disfiguring sand and blow holes, pock-marks, porous spots and small dents. If your supply house hasn't Smooth-On No. 4 Foundry Cements, write us.



FREE Sample and Handbook

Write for free trial sample—specifying shade you wish to try. We'll send also the famous 40-page Smooth-On Handbook of time-saving, money-saving repairs made with various Smooth-On Iron Cements. Send NOW.

SMOOTH-ON MFG. CO., Dept. 17G.
570 Communipaw Ave., Jersey City 4, N. J.

Do it with **SMOOTH-ON**
FOUNDRY CEMENT

DOUBLE YOUR PRODUCTION—with the fastest and most powerful Rammer made—

NO. 4 DAYTON RING VALVE BENCH RAMMER

Aside from its efficiency, the chief advantage of this Rammer lies in its long life. The Valve Unit will last for years without repair or replacement. The Cylinder Bore and Piston Rod are HARD CHROME PLATED, features which double the life of the Rammer and reduce maintenance costs at least one-half.

Have been adopted as standard by some of the largest users of Rammers throughout the Country. MADE IN FIVE SIZES. Send for Bulletin No. 300.

DAYTON PNEUMATIC TOOL CO., DAYTON, O.

To help solve your Core Production Problems

1. UNIFORM QUALITY

Our rigid raw material specifications, "lab" controlled processing, plus constant vigilance from original inspection to final shipment, assure uniform quality of Dayton Coré Oil.

2. TECHNICAL ASSISTANCE

To assure your getting the proper oil for every job, allow our experienced engineers to assist you with your core room problems.

3. LABORATORY ANALYSIS

Twenty-eight years of experience in the core oil field and continual laboratory research for the properties required in quality core oils enable us to manufacture the oil best suited to your needs.

SALES ENGINEERS: G. R. Sager, E. Jesse James, Dayton, Ohio; E. G. Allen, Coldwater, Mich.; E. E. Hook, Syracuse, N. Y.; Thomas H. Beaulac, Franklin, Penna.

DISTRIBUTORS: Joseph C. Rindt, Englishtown, N. J.; Jack Hayes, J. B. Hayes Co., Birmingham, Ala.

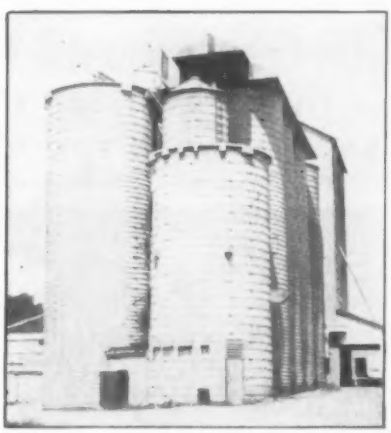
"ASK THE MEN WHO USE IT"

Look to DAYTON CORE OIL

- PRODUCE BETTER CORES
- AT LOWER OVER-ALL COST
- CLEANER, MORE UNIFORM CASTINGS

Also DOCO BINDER & CORE PASTE • DOCO STEEL CORE AND MOLD WASH

FAST IN TWO SENSES



Because the Super-Concrete Staves lay up readily, Neff & Fry Storage Bins are erected fast; i.e., in a comparatively short time.

The staves interlock together firmly. The tiers are securely bound with heavy galvanized steel rings. The materials are enduring. So Neff & Fry Bins stand fast; i.e., ruggedly, for a long time.

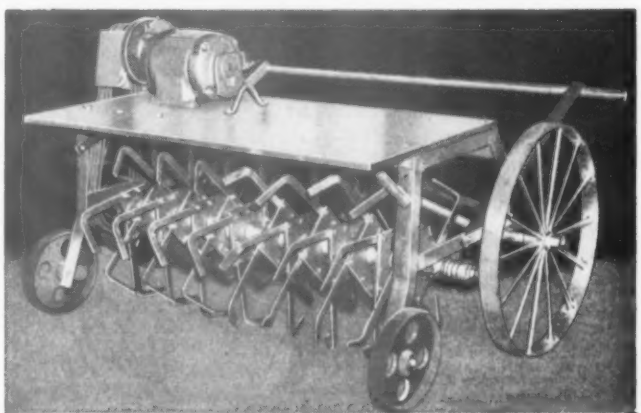
Experience over a period of almost 30 years proves that Neff & Fry Super-Concrete Stave Storage Bins serve from one generation to the next with virtually no upkeep cost. Many of the leading manufacturing, processing, mining, quarrying, distributing, and transportation companies of the country will testify that this is true.

We'll gladly give you the evidence. Get it before you contract for storage bins. Write, wire, or phone us.

NEFF & FRY STORAGE BINS

FOR ALL SORTS OF BULK FLOWABLE MATERIALS

THE NEFF & FRY CO., Camden, Ohio



MORE VOLUME FROM S & B SANDCUTTERS

Will thoroughly cut, mix and aerate approximately two tons of sand per minute, heaping sand in neat, triangular-shaped windrow. A simple, lightweight unit, durably constructed. Requires negligible maintenance. Write NOW for FREE literature.

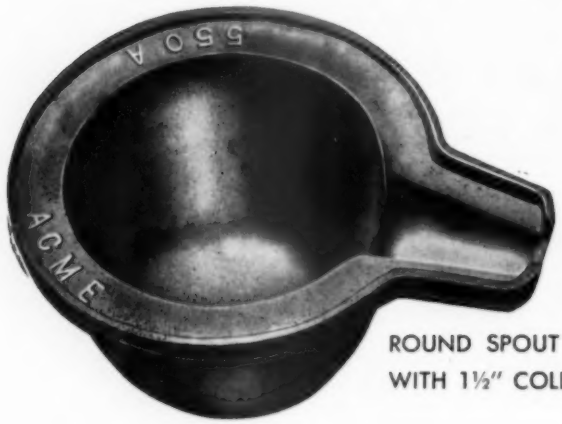
S&B SANDCUTTERS

SATHER MANUFACTURING CO., INC.

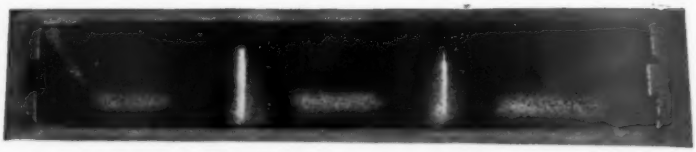
3330 McDougall Everett, Wash.

MELTING POTS—Ingot Molds

for ALUMINUM AND OTHER NONFERROUS METALS. 45 SIZES.



ROUND SPOUT POT NO. 550A
WITH 1½" COLLAR ON FLANGE



INGOT MOLD NO. AA-6

WRITE
for CATALOG "F"

HOLDING BOWL
NO. HP7001

Made of Acme SPECIAL-M-Heat Resisting Iron
— They Stand the Heat!

ACME FOUNDRY COMPANY

2502 22nd Street **DETROIT 16, MICH.** *Phone:* Tashmoo 5-2404

NOW . . . YOU CAN GET . . .

ECONOMICAL — FAST ACCURATE CONTROL
of all elements in the production of
DUCTILE CAST IRON!

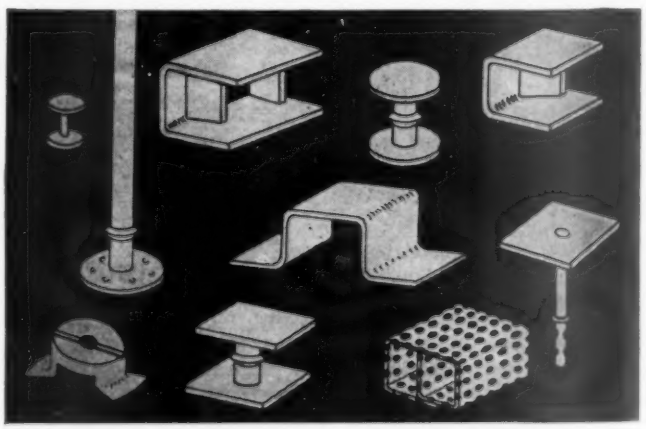
Foundries are getting new precision and speed in metallurgical control either through their own N.S.L.* equipment or by subscribing to our analytical service. A few of the elements determined spectrographically appear in the box opposite . . .

Write for complete information.

Magnesium
Copper
Aluminum
Titanium
Zirconium
Bismuth
Cerium
and
Others

***NATIONAL SPECTROGRAPHIC LABORATORIES, Inc.**
6300 Euclid Avenue • Cleveland 3, Ohio

There's always one Chaplet that's best for each job
ARE YOU SURE YOU'RE USING IT?

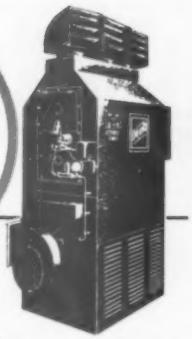


The large variety of "Buffalo" Chaplet designs enables you to meet your needs *exactly*. Given this broad selection, you are always assured of greater strength, easier burning-in and higher resistance to chilling for each specific job.

CATALOG NO. 15 offers complete details on designs, sizes and gauges. Copies mailed promptly. Samples of any "Buffalo" Chaplet will be gladly furnished.

Combined **SUPPLY & EQUIPMENT CO., INC.**
211 CHANDLER ST., BUFFALO 7, N. Y.

What OTHER HEATING METHOD CAN *Match*



all THESE BENEFITS

DRAVO *Counterflo* HEATERS *Offer...*

- LOW FIRST COST...Users report savings of 50% to 65%.
- WORKING-ZONE WARMTH...Units heat 4,000 to 20,000 sq. ft.
- NO FUEL WORRIES...Burn oil or gas—readily converted.
- LOW OPERATING COST...80-85% efficiency.
- AUTOMATICALLY CONTROLLED...On-off or modulating controls.
- EASY INSTALLATION...Only fuel, electric and exhaust connections.
- LONG LIFE—LOW MAINTENANCE...Stainless Steel chamber.
- TESTED—APPROVED...AGA and/or UL seal.
- AVAILABLE...Immediate delivery, no delays.

FOR FULL INFORMATION . . . DROP A CARD OR A LETTER FOR BULLETIN BG-523

DRAVO CORPORATION
DRAVO BUILDING, PITTSBURGH 22, PA.
Sales Representatives in Principal Cities
Mfd. and Sold in Canada by Marine Industries, Ltd., Sorel, Quebec

DRAVO

INSTALL THIS *NEW SAFETY DEVICE NOW!*

Recommended and Approved by FACTORY MUTUAL
(Assoc. F.M. Fire Insurance Cos.)

NORWALK CUPOLA BACK PRESSURE VALVE
for cupola air lines

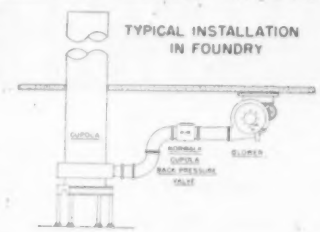
NORWALK
CUPOLA CHECK VALVE
FM APPROVED
NORWALK VALVE Co.
SOUTH NORWALK, CONN.

PREVENTS production interruptions because of blower damage; prevents back flow of combustible gases into piping blower and foundry itself.

A major factor in foundry explosions is failure of the human element. The man in charge of cupola operation forgets to close the blast gate in the air blast line to the cupola, following shutdown of blower during a melt. Combustible gases then find their way through the windbox air blast piping and blower into blower room and foundry, instead of upward through charge and out stack.

Associated Factory Mutual Fire Insurance Companies recommend the Norwalk Cupola Back Pressure Valve to guard against this potential explosion cause . . . failure in the human element.

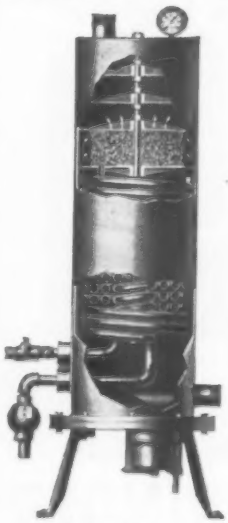
Write for recommendations on guarding yourself against interrupted production this easy low cost way.



Sold Exclusively Through

WHITING CORPORATION
NORWALK VALVE COMPANY
SOUTH NORWALK, CONN.

DELIVER COMPRESSED AIR



Capacities
50 to 2000 CFFAPM
Sizes
1" to 4"

COOL • CLEAN • DRY
TO POINT OF USE

★

INSTALL A MURPHY A.S.F.

★

Guaranteed not alone to cool, clean and dry compressed air, but to deliver it so to point of use.

Built in 1", 1½", 2", 3", and 4" sizes, with capacities of 50 to 2,000 CFFAPM.

Completely automatic and highly efficient. Guaranteed to perform as advertised or money back. Write for literature and prices.

GUARANTEED COMPRESSED AIR PRODUCTS

AFTERCOOLERS • SEPARATORS • STRAINERS • TRAPS
SPRAY GUNS • PISTOL SPRAYERS

JAS. A. MURPHY & CO.
FIFTH AND VINE STREETS, HAMILTON, OHIO
Moisture Elimination Up To 3000 Pounds Per Square Inch

PressureCAST by CENTRAL

30th ANNIVERSARY

WOOD and METAL PATTERNS

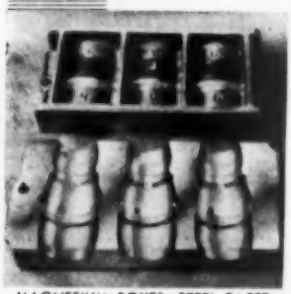
FULLY MACHINED PATTERNS and CORE BOXES
of Aluminum, Magnesium, Bronze and Steel

PressureCAST •PLATES •PATTERNS •CORE BOXES PLASTIC •PLATES •PATTERNS •CORE BOXES

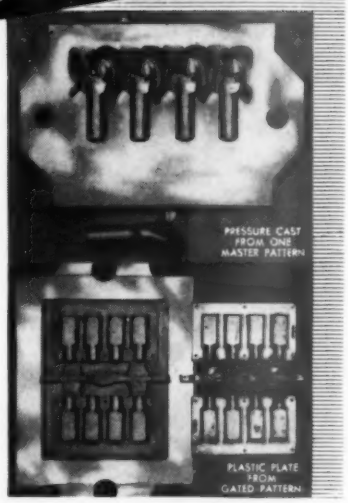
PERMANENT MOLDS and DIES

Non-ferrous Sand Castings . . . Zinc and Aluminum Die Castings

CENTRAL PATTERN CO., QUINCY, ILL.



MAGNESIUM BOXES, STEEL FACED



BLYSTONE • MIXERS •

THE paddle-type mixer for core sand mixing in the foundry. Blystone Mixers offer: low mix cost, thorough mixing, and easy operation. There is a sturdily built type and size for your problem. Send for Bulletin and full details.

• BLYSTONE DIVISION •
STANDARD SAND & MACHINE CO
549 W. Washington Boulevard, Chicago, Illinois

PAINTS OVER RUST!

RUSTREM STOPS RUST!

No priming, scraping, brushing

Rustrem paints right over rust. For stacks, fire escapes, bridges, fences, flashings...all metal. Farm, auto, marine, machinery. Black and aluminum.

SPECO, Inc. 7308 Associate Ave. Cleveland 9, Ohio

IT'S THE "STANDARD" FOR PEAK EFFICIENCY!

TWIN-MOTOR VARIABLE SPEED

SNAGGING GRINDERS

Infinite Speed . . . . 9500 S. F. P. M. at all times!

Each operator entirely independent of the other!

Two Motors—Two Speed Controls
(Cannot be Over Speeded!)

Save Time and Wheel Costs! Write for Catalog 44 today.

THE STANDARD ELECTRICAL TOOL CO.
2507 RIVER RD. CINCINNATI, OHIO

Produce BETTER CASTINGS at LOWER COST PER MELT!

Endorsed By

Leading Foundries

with PURO-SEAL FLUXES

FOR ALUMINUM

AD-2 A DE-GASSING Flux containing an efficient grain refiner to produce clean, sound, porosity-free castings of top quality.

AG-3 A PERMANENT MOLD Flux designed to produce castings free of cracks and shrinkage, combined with an efficient cleansing agent.

AC-4 A COVER FLUX used by foundries and smelters for cleansing, refining and obtaining maximum metal recovery.

FOR BRASS & BRONZE

CST-1 A COVER & REFINING FLUX to promote and accelerate the elimination of pores and reduce zinc fumes and scrap losses due to oxide inclusions and dross. (WILL NOT ATTACK REFRACTORIES)

Write TODAY for CONVINCING TRIAL PROPOSAL

BALANCED FLUX

PURO SEAL

FOR THE PURIFICATION OF METALS

THE PURO-SEAL COMPANY

414 SWETLAND BLDG., CLEVELAND 14, OHIO

CENTRIFUGAL CASTING MACHINES

Model AS

Model J

Model M

Model J-P

These machines used to make ferrous and non-ferrous centrifugal castings are produced by the pioneer manufacturer of such equipment.

They are made in a large variety of styles and a wide range of sizes. Complete technical information is supplied concerning sand and permanent mold design, gating, sand mixes, speeds, etc.

Send us drawings or sketches of parts you are interested in casting centrifugally, and we will tell you, without obligation, if and how our machines can cast them faster, cleaner and with fewer rejects.

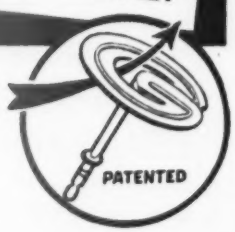
CENTRIFUGAL CASTING MACHINE COMPANY

Nathan Janco, *President*

P. O. Box 947 Tulsa 1, Okla.

If you look everywhere

YOU CANNOT FIND A CHAPLET THAT GIVES AS SOUND CORE SUPPORT AS THIS PATENTED OPEN HEAD CHAPLET



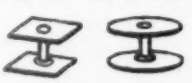
The Patented Open Head permits sounder packing of sand under the head and around the stem, reduces core support failures and casting rejects. *Try them and see!*

CLEVELAND CHAPLET & MFG. CO.

West 67th St. & N. Y. C. Ry.

CLEVELAND, OHIO

MOTOR CHAPLETS



CLEVELAND *Chaplets*

Since 1890

Announcing PERMABRASIVE

the NEW IMPROVED Shot and Grit
SPECIALLY TREATED TO:

Licensed Under
U. S. Patent No. 2184926.
U. S. Application No. 619602

improve softness and toughness
provide longer life
reduce abrasion of machine and parts
cut cleaning costs

Special treatment of the carbon content gives PERMABRASIVE a softer, tougher body that holds its original form longer, reduces wear on machine parts, cutting repair and replacement time; provides more continuous operating time and makes substantial cuts in per-piece cleaning costs.

Prove PERMABRASIVE advantages in your own plant. Get in touch with our nearest office for details and costs.

Manufactured by NATIONAL METAL ABRASIVE CO., Cleveland, Ohio • WESTERN METAL ABRASIVE CO., Chicago Hts., Illinois

Hickman, Williams & Company
INCORPORATED

CLEVELAND • NEW YORK • INDIANAPOLIS • CHICAGO • PITTSBURGH • CINCINNATI • ST. LOUIS • PHILADELPHIA • DETROIT

Master Power
HARD CHROMED • PORTABLE PNEUMATIC TOOLS

DO MORE WORK AT LESS COST
because they deliver more power per cubic foot of air consumed, are light in weight for easier maneuverability and they retain their new tool power longer.

ARE PREFERRED BY OPERATORS
because they are lighter in weight, better balanced and designed to reduce shock and be free from vibration.

IF YOUR PROBLEM INCLUDES
chipping, ramming, grinding, buffing, sanding or wire brushing, *write us today for full particulars.*

THE MASTER PNEUMATIC TOOL COMPANY, INC.
ORWELL, OHIO • U. S. A.
SALES • SERVICE • STOCK • COAST TO COAST

AMERICAN BRITISH CHEMICAL SUPPLIES, Inc.
180 MADISON AVE. NEW YORK 16, N. Y.
A. B. C. FOUNDRATES-FLUXES & COATINGS
for Aluminum—Brass—Bronze & Grey Iron
are made of
DEPENDABLE COMPOSITION under LABORATORY CONTROL
at our plant Kay Fries Chemicals Co.
West Haverstraw, N. Y.

EF
GAS, OIL AND ELECTRIC
FURNACES
For all annealing and heat treating requirements
THE ELECTRIC FURNACE CO. • SALEM, OHIO

WILLIAMS Buckets

"HOOK-ON"
SINGLE LINE
Special Type for
FOUNDRY SERVICE
3/8 to 2 cu. yd. cap.
Send for descriptive bulletin.
THE WELLMAN ENGINEERING CO.
7019 Central Ave. Cleveland, Ohio

***built by* WELLMAN**

GLUTRIN
LIQUID BINDER

GOULAC
DRY BINDER

For

CORE WORK, SAND FACINGS, SPRAYS

Write for pamphlets giving detailed information. Both materials carried in stock by America's foremost foundry jobbers

Robeson Process Company
(Established 1905)

American Gum Products Co.
(Established 1915)

GENERAL OFFICES: 500 FIFTH AVENUE • NEW YORK 18, N. Y.

A BLAST FURNACE PRODUCT

Smelted from Superior quality lake ores, high grade metallurgical coke and limestone, using our own local No. 1 Sharon Seam coal.

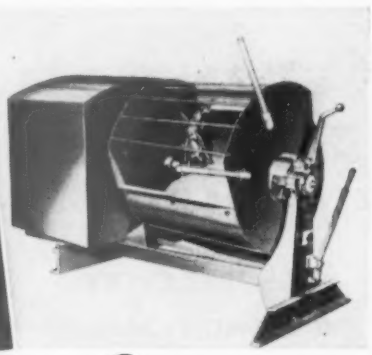
HIGH SILICON IRON JISCO

A "blend" with JISCO is sound metallurgy.

THE JACKSON IRON & STEEL Company
JACKSON, OHIO

CMC

WONDER Sand MIXERS



New Mixing Efficiency

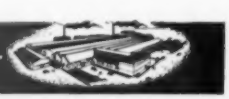
EXCLUSIVE TRIPLE MIXING HOES . . .

Tops in the field! Triple mixing Hoes have adjustable blades . . . easily set for correct clearance. Mixing is *thorough* and "end to end". Advance CMC design makes charging and discharging *easier than ever before!* 6 cu. ft. capacity shown. Write today for full details.

RENEWABLE DRUM LINERS

Easily, replaceable full-hard abrasion resistant alloy steel drum liners are your assurance of lowest upkeep and minimum operating costs.

CONSTRUCTION MACHINERY CO'S.



10 GRADES OF WASHED, DRIED, SCREENED

SILICA FOUNDRY SANDS

Produced from celebrated Ottawa District St. Peter Sandstone • Rounded Grains

Steel Molding Sand • Core Sand • Blast Sand • Furnace Bottom Sand
Opener Sand • Sand for Non-Ferrous, Aluminum, Magnesium Castings
MICROSIL Ground Silica (5 Standard Grades of Silica Flour)

MICROSIL GROUND SILICA

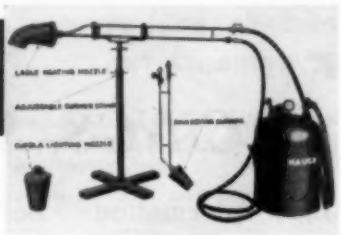
STANDARD SILICA CORPORATION

209 South LaSalle Street, Chicago • and • Ottawa, Illinois

DISTRIBUTORS IN ALL PRINCIPAL CITIES

BLACKHAWK SILICA SAND

1 COMBINATION DOES 4 JOBS



- LIGHTS CUPOLAS
- HEATS LADLES
- DRIES MOLDS
- PREHEATS CASTINGS

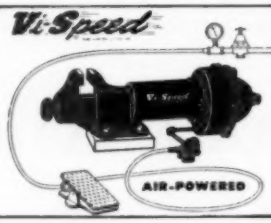
Oil-Burning, instant lighting, no preheating, adjustable flame size; simple, speedy, economical, safe, versatile. Write for Catalog on this and other compressed air and hand pump burners.

HAUCK
All-Purpose BURNER OUTFIT

No. 2-5-E Outfit; interchangeable burner nozzles and portable burner stand; burns oil with air at 40 p.s.i. or higher.

HAUCK MANUFACTURING CO. 106 Tenth St., Brooklyn 15, N.Y.

Vi-Speed



FAST • RUGGED
HOLDING • PRESSING • PUNCHING
SIMPLE DESIGN • 8 MODELS
Guaranteed
WRITE FOR CATALOG

VAN PRODUCTS CO.
1202 G. O. BALDWIN BLDG.
ERIE, PENNA.

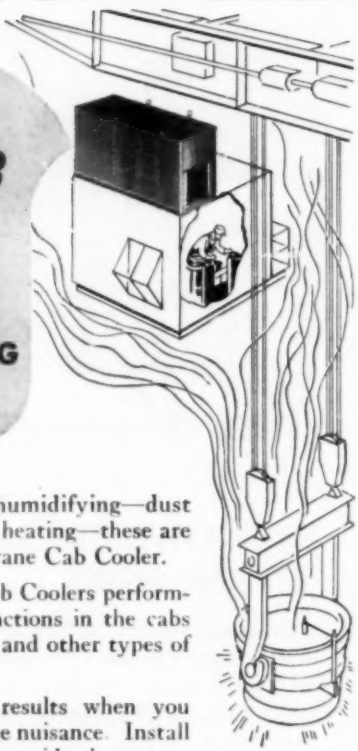
CHEMISTS and METALLURGISTS

Grey Iron Foundry Consultants
Complete Foundry Testing
Established over 25 years

A. H. PUTNAM COMPANY
Rock Island, Illinois

DRAVO CRANE CAB COOLERS

PERFORM EVERY AIR CONDITIONING FUNCTION



Cooling—fume removal—dehumidifying—dust filtering—ventilating—winter heating—these are the functions of the Dravo Crane Cab Cooler.

You will find Dravo Crane Cab Coolers performing these air conditioning functions in the cabs of soaking pit, ladle, stripper, and other types of hot-metal cranes.

And you will observe real results when you eliminate heat fatigue and fume nuisance. Install Dravo Crane Cab Coolers to provide these comfortable working conditions in the cabs of hot-metal cranes.

DRAVO CORPORATION

PITTSBURGH • PHILADELPHIA • CLEVELAND • NEW YORK
CHICAGO • DETROIT • ATLANTA • BOSTON
Sales Representatives in Principal Cities

DRAVO

MODERN BLAST CLEANING AND VENTILATION

By C. A. Reams

Most approved methods of blast cleaning and ventilation are fully covered from the standpoint of modern practices. A valuable text covering the entire field and its allied equipment.

200 pages
28 tables
38 illustrations

Price
$4.00
Postpaid

THE PENTON PUBLISHING CO.
Book Department
1213 W. 3rd St., Cleveland 13, Ohio

What are you doing to correct your SCRAP LOSS?

CROBAUGH LABORATORIES

FOUNDRY CONSULTING and METALLURGICAL SERVICE

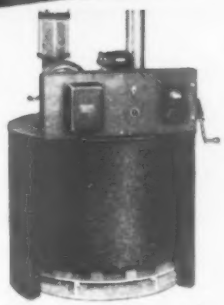
SAVES many times its cost

THE FRANK L. CROBAUGH COMPANY
1426 W. 3rd St. Cleveland 13, O. SU-4712
Over 50 years Service

Save in the Core Room *Reduce* Core Losses

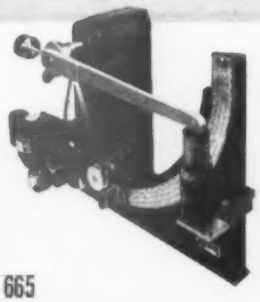
No. 620 Impact Tester

Most cores must be transported from core making station to oven in the green condition, and are subjected to many impacts or jolts in the process. Improve core mixtures for sagging resistance, overhang ability, and cracking resistance. Use the Dietert-Detroit No. 620 Impact Tester to improve core mixtures and help core production.



No. 606 Test Core Baking Oven

Determine the uniformity, quality, economy and best baking conditions for Core Binders. The Dietert-Detroit Test Core Baking Oven does this by producing selected, controlled baking conditions day after day. Meets A.F.S. Specifications.



No. 665 Green Core Strength Accessory

This Accessory, which easily attaches to The Universal Sand Strength Machine, enables you to measure the green strength of core mixtures with precision, within 0.01 psi. By using it, you can institute practices to supply the core maker with sand that works the same from batch to batch. The Green Compressive Strength of the core mixture determines the stand-up ability of a green core.

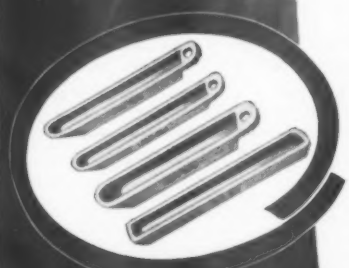
CONTROL EQUIPMENT
SAND · MOLD · MOISTURE
CARBON · SULFUR

HARRY W. Dietert COMPANY

9330 ROSELAWN AVE. • DETROIT 4, MICHIGAN

The trend is toward

HIGHER COMBUSTION TEMPERATURES



LECO COMBUSTION BOATS

have been designed to withstand temperatures up to 2700° Fahrenheit.

In addition they give you these features:

- Fast preheating because of light weight.
- Resist heat shock to permit reuse of the boat for repeated combustions.
- Sulphur free.
- Carbon free, except as contaminated from handling.
- ***VERY LOW COST***

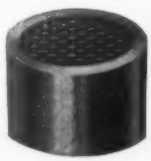
There is a Leco Combustion Boat to suit your every requirement. Large stocks of standard shapes and sizes are maintained to assure immediate delivery. Special shapes may be furnished upon request.

Compare the Leco boat with any other on the market. We will furnish you free samples for this purpose.

LABORATORY EQUIPMENT CORPORATION
BENTON HARBOR, MICHIGAN

SMILLIE
CORE BOX VENTS

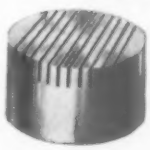
SCREEN TYPE



Crimped Tightly
Eliminating
Loose Screens • Sagging Screens

Made in Sizes 1/4 — 5/16 — 3/8 — 7/16 — 1/2 — 5/8
Also #30 #40 #50 Monel Mesh

SLOTTED TYPE

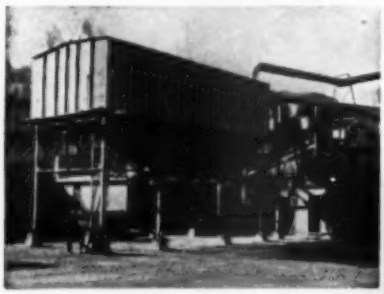


Made in Sizes 1/8" to 1 1/4" in 1/16" Steps

Deep or Shallow Head .010 or .014 Slots
Workable for Contours
Greater Vent Area

C. M. SMILLIE & CO.

1124 WOODWARD HGTS., FERNDALE 20, MICHIGAN
TOOLS • PRECISION MACHINED and GROUND PARTS • FIXTURES



28 years experience in designing, building and installing dust-control equipment is at your service. Call for one of our engineers, or write for free booklet . . . "Mastery of the Air".

SAND BLASTING EQUIPMENT

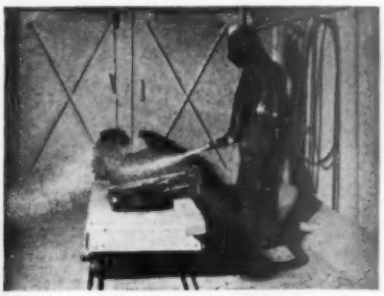
· DUST ARRESTORS ·

Reasonable Delivery.

Parsons

ENGINEERING CORP.

2545 EAST 79th ST. CLEVELAND 4, OHIO



Parsons blast rooms, suction cabinets, oscillating blast barrels and accessories, do the job faster . . . better. Custom built to give year after year service, and trouble-free operation.

EMPIRE THAT GOOD **By-Product Coke:**

★ FOR FOUNDRY • METALLURGICAL • CHEMICAL • WATER GAS • DOMESTIC USES ★

PHONE 3-9135

DeBARDELEBEN COAL CORPORATION

Transportation Building BIRMINGHAM 3, ALA.

DeBardeleben Preparation and Service Give Added Value

PRODUCERS CORE SAND CORPORATION

PITS AT MICHIGAN CITY, INDIANA AND SAWYER, MICHIGAN

MICHIGAN CITY, INDIANA

RAPPING PLATES

MANUFACTURED BY

PACIFIC GRAPHITE COMPANY INC.

40TH AND LINDEN STREETS - OAKLAND 8, CALIFORNIA

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words, $2.00. Additional words 7c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $4.00. Additional words 12c each.

NOTE—If replies are to be sent to a box number in care of THE FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

INCH RATES PER INSERTION

Single Column 2¼" Wide	One Time	Three Times	Six Times	Twelve Times
1 inch	$ 12.00	$11.00	$10.00	$ 9.00
2 inches	21.75	20.00	18.25	16.75
3 inches	32.00	29.25	26.75	24.00
4 inches	40.00	36.75	33.25	30.00
5 inches, ½ col.	48.00	44.00	40.00	36.00
6 inches	58.75	53.25	48.00	42.75
7 inches	66.00	60.00	54.00	48.00
8 inches	73.25	66.75	60.00	53.25
10 inches, 1 col..	88.00	80.00	72.00	64.00
Half Page	130.00	120.00	110.00	100.00
Full Page	220.00	200.00	180.00	160.00

Remittance should accompany advertisement when submitted—Cash Discount 2%, 10 days.

THE FOUNDRY

Penton Building, Cleveland 13, Ohio

WHERE-TO-BUY

The following classified list of products of the advertisers in THE FOUNDRY is conducted for the convenience of our readers in quickly locating sources of foundry equipment and supplies

ABRASIVE (Bricks and Files)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Norton Co., Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Div., Cleveland Quarries Co., Tiffin, O.

ABRASIVE BELTS

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

ABRASIVE CLOTH and PAPER

Behr-Manning Div. of Norton Co., Worcester 6, Mass.
Carborundum Co., Niagara Falls, N. Y.
Minnesota Mining & Mfg. Co. 900 Fauquier St., St. Paul 6, Minn.

ABRASIVE CUTOFF MACHINES

Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

ABRASIVE DISCS

Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.

ABRASIVE (Metallic)—See SHOT and GRIT

ABRASIVE WHEELS

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Niagara Falls, N. Y.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Div., Cleveland Quarries Co., Tiffin, O.
United States Rubber Co., 1230 Sixth Ave., New York 20, N. Y.

ACETYLENE (Cylinders and Tanks)

Air Reduction Sales Co., 60 East 42 St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

ADHESIVES (Special)

National Starch Products Inc., 270 Madison Ave., New York 16, N.Y.

ADHESIVES (Wood, Metal, Leather)

National Starch Products Inc., 270 Madison Ave., New York 16, N.Y.

AERATORS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.

AFTERCOOLERS (Compressed Air)

Jas. A. Murphy & Co., Hamilton, O.

AIR COMPRESSORS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

AIR COMPRESSORS (Cont'd.)

Campbell-Hausfeld Co., Harrison, O.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis, Mo.
Fuller Company, Catasauqua, Pa.
Gardner-Denver Co., Gardner Drive, Quincy, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.
Spencer Turbine Co., Hartford, Conn.

AIR CONDITIONING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis, Mo.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

AIR CONTROL EQUIPMENT

Air-Way Pump & Equipment Co., 1050 N. Kilbourn, Chicago, Ill.
American Air Filter Co., Louisville 8, Ky.
Foxboro Company, Foxboro, Mass.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Murphy, Jas. A., & Co., Hamilton, O.

AIRLESS BLAST CLEANING EQUIPMENT

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W. 4753 Train Ave., Cleveland 2, O.

AIR LINE LUBRICATORS

Cleco Division of Reed Roller Bit Co., Houston, Tex.
Independent Pneumattic Tool Co., Aurora, Ill.

ALLOYS

Ajax Metal Co., 46 Richmond St., Philadelphia 23, Pa.
Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.
Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Globe Iron Co., Jackson, Ohio
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.

ALLOYS (Ferro)

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Keokuk Electro Metals Co., Keokuk, Iowa
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, Ohio
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

ALUMINUM and ALUMINUM ALLOYS

Ajax Metal Co., 46 Richmond St., Philadelphia 23, Pa.
Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Federated Metals Division, American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.
Niagara Falls Smelting & Refining Div., Continental - United Industries, Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Sonken-Galamba Corp., Kansas City 18, Kansas.
Western Metals Co., 3201 So. Kedzie Ave., Chicago 23, Ill.

ALUMINUM INGOTS

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Cleveland Electro Metals Co., West 38th St. & NP R. R., Cleveland 13, O.
Niagara Falls Smelting & Refining Div., Continental - United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Western Metals Co., 3201 So. Kedzie Ave, Chicago 23, Ill.

ANALYTICAL EQUIPMENT

National Spectrographic Laboratories Inc., 6300 Euclid Ave., Cleveland, Ohio.

ANNEALING BASKETS

Pressed Steel Co., Wilkes-Barre, Pa.

ANNEALING BOXES

Pressed Steel Co., Wilkes-Barre, Pa.

ANNEALING CORES

Pressed Steel Co., Wilkes-Barre, Pa.

ANNEALING FURNACES (Electric)

Ajax Electrothermic Corp., Trenton, N. J.
General Electric Co., Schenectady, N Y.

ANNEALING POT RAPPERS

New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

ANNEALING TUBES

Pressed Steel Co., Wilkes-Barre, Pa.

ARGON

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

ARRESTORS (Dust)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 25, Ohio.
Pangborn Corp., Hagerstown, Md.

ASSOCIATIONS

Crucible Manufacturers Association, 90 West St., New York 6, N. Y.

BAND SAWS

Atlantic Saw Mfg. Co., New Haven, Conn.

BANDS (Snap Flask)

Adams Co., Dubuque, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

BARS (Steel)

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

BASKETS (Annealing)

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Pressed Steel Co., Wilkes-Barre, Pa.

BEARINGS (Anti-Friction, Roller and Ball)

Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Timken Roller Bearing Co., Canton 6, O.

BELTING (Conveyor, Elevator)

Hewitt Rubber Div. Hewitt-Robins Div., Inc., 240 Kinsington Ave., Buffalo 5, N. Y.
Imperial Belting Co., 1800 So. Kilbourn Ave., Chicago 23, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Raybestos-Manhattan Inc., Manhattan Rubber Division, Passaic, N. J.

BELTS (Abrasive)

Minnesota Mining & Mfg. Co. 900 Fauquier St., St. Paul 6, Minn.

BELTS (Power Transmission)

Imperial Belting Co., 1800 So. Kilbourn Ave., Chicago 23, Ill.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Raybestos-Manhattan Inc., Manhattan Rubber Division, Passaic, N. J.

BENTONITE

American Colloid Co., 363 W. Superior St., Chicago 10, Ill.
Baroid Sales Division, 830 Duncommun St., Los Angeles 12, Calif.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.

BINS (Storage)

American Bridge Co., Pittsburgh 19, Pa.
Bartlett & Snow, C. O. Co., 6201 Harvard Ave., Cleveland 5, O.
Neff & Fry, Camden, O.

BLACKING (Mold Core)

Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Stevens, Frederic B., Inc., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

BLASTING EQUIPMENT

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

BLAST METERS

Foxboro Company, Foxboro, Mass.

BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Campbell Hausfeld Co., Harrison, O.
Ingersoll-Rand Co., 11 Broadway, New York, N. Y.

—When writing advertisers, please mention THE FOUNDRY—

BLOWERS (Cont'd.)

Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Stroman Furnace & Engineering Co., Division of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

BOLTS and NUTS

American Bridge Co., Frick Bldg., Pittsburgh 19, Pa.
Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

BOND CLAY

American Colloid Co., 363 W. Superior St., Chicago 10, Ill.
Baroid Sales Division, 830 Ducommun St., Los Angeles 12, Calif.
Eastern Clay Products Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Ironton Fire Brick Co., Ironton, O.

BOOKS (Technical)

Penton Publishing Co., 1213 West 3rd St., Cleveland 13, O.

BOTTOM PLATES and BOARDS

Adams Co., Dubuque, Iowa.
Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Dougherty Lumber Co., 4300 East 68th St., Cleveland 5, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.
Wadsworth Equipment Co., 2457 Mogadore Rd., Akron, Ohio.

BOWLS and SHANKS

Industrial Equipment Co., Minster, Ohio.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

BOXES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

BOXES (Tote)

Penn Iron Works, Reading, Pa.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

BRAKES (Magnetic)

Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

BRICK (Refractory)

Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Norton Co., Worcester 6, Mass.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio.
Chas. Taylor Sons Co., P. O. Box 58, Annex Sta., Cincinnati 14, Ohio.

BRIQUETS (Alloy)

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

BRIQUETS (Ferro Alloy)

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

BRIQUETS (Silicon Carbide)

Carborundum Co., Perth Amboy, N. J.

BRIQUETING MACHINERY (Metal)

Milwaukee Foundry Equipment Co., 3328 Pierce St., Milwaukee 4, Wis.

BRUSHES

Independent Pneumatic Tool Co., Aurora, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.

BUCKETS (Elevating, Clam Shell, Drag Line, Grab, Loader, Dumping)

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Penn Iron Works, Reading, Pa.
Wellman Engineering Co., 7000 Central Ave., Cleveland, O.

BUILDING and ENGINEERING SERVICE

American Bridge Co., Pittsburgh 19, Pa.

BURNERS (Acetylene, Oil, Gas, Powdered Coal, Stoker)

Hauck Mfg. Co., 106 Tenth St., Brooklyn 15, N. Y.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

BUSHINGS (Flask-Pin)

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Smillie & Co., C. M., 1100 Woodward Hgts. Blvd., Ferndale, Mich.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

CALCIUM BORIDE

Molybdenum Corporation of America, Pittsburgh 19, Pa.

CALCIUM MOLYBDATE

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

CARBON BOOSTER

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CARS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

CARS (Mold Drying)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

CASTINGS

City Pattern Foundry & Machine Co., 1165 Harper Ave., Detroit 11, Mich.
Wheland Co., Chattanooga, Tenn.

CASTING MACHINES (Centrifugal)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Centrifugal Casting Mach. Co., Tulsa, Okla.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

CASTING MACHINES (Permanent Mold)

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

CASTING SEALER

Tousey Varnish Co., 520 West 25th St., Chicago 16, Ill.

CASTINGS (Permanent Mold)

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

CEMENT (Metallic)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Smooth-On Manufacturing Co., 570 Communipaw Ave., Jersey City 4, N. J.

CEMENT (Refractory)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Norton Co., Worcester 6, Mass.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio.

CEREAL BINDERS

Foundry Service Co., Birmingham, Ala.
Chas. A. Krause Milling Co., 404 East State St. Milwaukee, Wis.

CHAIN (Hoist, Conveyor, Drive, Sling, etc.)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Chain Mfg. Co., Broadway & Henry Sts., Cleveland 5, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Taylor Chain Co., S. G., Hammond, Ind.

CHAIN (Steel Loading)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Chain Mfg. Co., Broadway & Henry Sts., Cleveland 5, Ohio.
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio.

CHAIN (Welded and Weldless)

Chisholm-Moore Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Chain Mfg. Co., Broadway & Henry Sts., Cleveland 5, Ohio.

CHAINS (Sling)

Cleveland Chain Mfg. Co., Broadway & Henry Sts., Cleveland 5, Ohio.

CHAPLETS

Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland, Ohio
Cleveland Chaplet & Mfg. Co., 1197 W. 64th St., Cleveland 2, O.
Combined Supply & Equipment Co., Inc., 215 Chandler St., Buffalo 4, N. Y.
Fanner Mfg. Co., Brookside Park, Cleveland 2, Ohio.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee 4, Wis.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Frederic B. Stevens, Inc., Detroit 16, Mich.

CHARCOAL

Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.

CHARCOAL (Briquets)

Ford Motor Co., Iron Mountain, Mich.

CHEMICALS

Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.

CHEMISTS

Crobaugh Co., Frank L., 1426 West Third St., Cleveland 13, Ohio.

CHILLS

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland, Ohio.
Fanner Mfg. Co., Brookside Park, Cleveland 2, Ohio.
Milwaukee Chaplet & Mfg. Co., 1023 So. 40th St., Milwaukee 4, Wis.
Standard Horse Nail Corp., New Brighton, Pa.

CHILL COATINGS

Acheson Colloids Corp., Port Huron, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

CHILL NAILS

Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland, Ohio.
Standard Horse Nail Corp., New Brighton, Pa.

CHIPPERS—See PNEUMATIC TOOLS

CHISELS (Chipping)

Cleco Division of Reed Roller Bit Co., Houston, Texas.
Independent Pneumatic Tool Co., Aurora, Ill.

CHROMIUM (Briquets)

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

CLAMPS (Flask)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Sterling Wheelbarrow Co., 1700 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.

CLAMPS (Permanent Mold)

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

CLAY (Bonding)

American Colloid Co., 363 W. Superior St., Chicago 10, Ill.
Carpenter Brothers, Inc., 606 West Wisconsin 3, Mo.
Baroid Sales Division, 830 Ducommun St., Los Angeles 12, Calif.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.

CLAY (Refractory)

Carpenter Brothers, Inc., 606 West Wisconsin 3, Mo.
Eastern Clay Products Inc., Jackson, O.
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Chas. Taylor Sons Co., P. O. Box 58, Annex Sta., Cincinnati 14, Ohio.

CLAY STORAGE BINS

Neff & Fry, Camden, O.

CLEANING EQUIPMENT (Castings)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.

CLUTCHES (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 622 S. 28th St., Milwaukee 4, Wis.

COAL STORAGE BINS

Neff & Fry, Camden, O.

COKE (Foundry)

DeBardeleben Coal Corp., 2201 First Ave., N., Birmingham 3, Ala.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Pickands, Mather & Co., Cleveland 14, O.
Republic Coal & Coke Co., 8 So. Michigan Ave., Chicago 3, Ill.
Semet-Solvay Div., Allied Chemical & Dye Corp., 40 Rector St., New York 6, N. Y.
Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.

COKE (Petroleum)

Republic Coal and Coke Co., 8 S. Michigan Ave., Chicago 3, Ill.

COLLECTORS (Dust)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Air Filter Co., 266 Central Ave., Louisville 8, Ky.
Bartlett & Snow, C. O. Co., 6201 Harvard Ave., Cleveland, O.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Schmieg Industries, 302 Piquette St., Detroit 2, Mich.
Schneible Co., Claude B., 2827-25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

CONCRETE STORAGE BINS

Neff & Fry Co., Camden, O.

CONTROL SYSTEMS (Dust)

American Air Filter Co., 223 Central Ave., Louisville, Ky.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

CONTROL SYSTEM (Dust) (Cont'd.)

Schmieg Industries, 302 Piquette St., Detroit 2, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

CONVERTER BLOWERS

Roots-Connersville Blower Corp., Connersville, Ind.

CONVERTERS (Bessemer)

Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

CONVEYOR DESIGN

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Valet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

CONVEYORS (Apron)

Logan Co., 580 Cabel, Louisville, Ky.

CONVEYORS (Belt)

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Imperial Belting Co., 1800 So. Kilbourn Ave., Chicago 23, Ill.
Jeffrey Mfg. Co., 901-99 N. Fourth St., Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Chain)

Chain Belt Co., 1671 W. Bruce St. Milwaukee 4, Wis.
Jeffrey Mfg. Co., 907-99 N. Fourth St. Columbus 16, O.
Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.
Jervis B. Webb Co., 8951 Alpine, Detroit 4, Mich.

CONVEYORS (Gravity)

Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., 104 Tenth St., Ellwood City, Pa.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Live Roller)

Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Magnetic)

Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

CONVEYORS (Monorail)

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 E. 283rd St., Wickliffe, O.

CONVEYORS (Monorail) (Cont'd.)

Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Mathews Conveyer Co., 104 Tenth St. Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Penn Iron Works, Reading, Pa.

CONVEYORS (Overhead)

Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Jervis B. Webb Co., 8951 Alpine, Detroit 4, Mich.

CONVEYORS (Pneumatic)

Fuller Company, Catasauqua, Pa.

CONVEYORS (Portable)

Joy Mfg. Co., Joy Division, Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

CONVEYORS (Portable-Gas Electric)

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

CONVEYORS (Rubber)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Standard Conveyor Co., North St. Paul 9, Minn.

CONVEYORS (Vibrating)

Ajax Flexible Coupling Co., Westfield, N. Y.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Simplicity Engineering Co., Durand, Mich.
Syntron Company, Homer City, Pa.

COPPER

Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

COPPER SHOT

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
Federated Metals Div.,
American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

CORE BINDERS

American Cyanamid Co., 30 Rockefeller Plaza, New York, N. Y.
American Gum Products Co., 500 Fifth Ave., New York 18, N. Y.
Bakelite Corp., 300 Madison Ave. New York 17, N. Y.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York 4, N.Y.
Dayton Oil Co., Dayton 1, Ohio.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
General Electric Co., Pittsfield, Mass.
Hercules Powder Co., Wilmington 99, Del.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Chas. A. Krause Milling Co., 404 E. State St., Milwaukee 1, Wis.
National Starch Products Inc., 270 Madison Ave., New York 16, N.Y.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Robeson Process Co., 500 Fifth Ave., New York 18, N. Y.
Superior Flake Graphite Co. 33 So. Clark St., Chicago 3, Ill.
Werner G. Smith Co., 2191 W. 110th St., Cleveland 2, O.

CORE BINDERS (Cont'd.)

Frederic B. Stevens, Inc., Detroit 16, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.
Velsicol Corp., 330 E. Grand Ave., Chicago 11, Ill.

CORE BLOWERS

Martin Engineering Co., Kewanee, Ill.

CORE BLOWING MACHINES

Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Supply Co. 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Harrison Machine Co., 2725 Station Rd., Wesleyville, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

CORE BOXES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Harrison Machine Co., 2725 Station Rd., Wesleyville, Pa.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.
Plastic Corp. of Chicago, 2444 So. Central Ave., Cicero 50, Ill.

CORE COMPOUND

Bakelite Corp., 300 Madison Ave. New York 17, N. Y.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Dayton Oil Co., Dayton 1, Ohio.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fordath Engineering Co. Ltd., West Bromwich. Birmingham, England
Werner G. Smith Co., 2191 W. 110th St., Cleveland 2, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
Velsicol Corp., 330 E. Grand Ave., Chicago 11, Ill.

CORE CUTOFF & CONING MACHINES

Wadsworth Equipment Co., 2457 Mogadore Rd., Akron, Ohio.

CORE DRAWING MACHINES

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Freeman Supply Co., Toledo 5, O.
Newaygo Engineering Co., Newaygo, Mich.

CORE DRIERS (Dielectric)

Allis Chalmers Mfg. Co., Milwaukee 1, Wis.

CORE GRINDERS (Power Operated)

Jeffrey Mfg. Co., Columbus 16, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.

CORE KNOCKOUT MACHINES

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Pangborn Corp., Hagerstown, Md.
Simplicity Engineering Co., Durand, Mich.

CORE MAKING MACHINES

Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.

CORE MAKING MACHINES (Cont'd.)

Wm. Demmler & Bros., Kewanee, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fordath Engineering Co. Ltd., West Bromwich, Birmingham, England
Harrison Machine Co., 2725 Station Rd., Wesleyville, Pa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Co., 3228 W. Pierce St., Milwaukee 4, Wis.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Wadsworth Equipment Co. 2457 Mogadore Rd., Akron, Ohio

CORE OILS

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Dayton Oil Co., Dayton 1, Ohio.
Delta Oil Products Co., Milwaukee 9, Wis.
Fordath Engineering Co. Ltd., West Bromwich, Birmingham, England
Foundry Service Co., Birmingham, Ala.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Werner G. Smith Co., 2191 W. 110th St., Cleveland 2, O.
Frederic B. Stevens, Inc., Detroit 26, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.
Velsicol Corp., 330 E. Grand Ave., Chicago 11, Ill.

CORE OVENS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, O.
Despatch Oven Co., Minneapolis 14, Minn.
Drying Systems Inc., 1800 Foster Ave., Chicago 40, Ill.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.

CORE PASTE

Corn Products Sales Co., 17 Battery Pl., New York 4, N. Y.
Dayton Oil Co., Dayton 1, Ohio.
Delta Oil Products Co., Milwaukee 9, Wis.
Eastern Clay Products Co., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

CORE PLATES (Steel, Asbestos)

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Johns-Manville, 22 E. 40th St., New York 16, N. Y.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.
Wadsworth Equipment Co. 2457 Mogadore Rd., Akron, Ohio

CORE ROD STRAIGHTENING and CUTTING MACHINERY

American Wheelabrator & Equipment Co., Mishawaka, Ind.

CORE SAND

Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Weldron Silica Co., 38 So. Dearborn St., Chicago, Ill.

CORE SAND MIXERS

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington St., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Fordath Engineering Co. Ltd., West Bromwich, Birmingham, England.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.

CORE STRIPPERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE SPRAYERS

Freeman Supply Co., 1152 Broadway, Toledo 5, O.

CORE TRAYS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

CORE TRUCKS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

CORE VENTS

Demmler, Wm., & Bros., Kewanee, Ill.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, Ohio.
Foundry Service Co., Birmingham, Ala.
Smillie, C. M. & Co., 1100 Woodward Heights Blvd., Ferndale, Mich.
United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

CORE WASH

Bloomsbury Graphite Co., Bloomsbury, N. J.
Carborundum Co., Perth Amboy, N. J.
Cities Service Oil Co., 3200 S. Western Ave., Chicago 8, Ill.
Corn Products Sales Co., 17 Battery Pl., New York City 4.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co. 4600 E. 71st St., Cleveland 5, O.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.
Stevens, Frederic B., Inc., Detroit 26, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United Oil Mfg. Co., 1429 Walnut St., Erie, Pa.
United States Graphite Co., Saginaw, Mich.

CORE WIRE CUTTERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORE WIRE STRAIGHTENERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

CORES (Annealing)

Pressed Steel Co., Wilkes-Barre, Pa.

COUPLINGS (Air Line)

Cleco Division of Reed Roller Bit Co., Houston, Texas.
C. B. Hunt & Sons Inc., Salem, Ohio

COUPLINGS (Flexible)

Ajax Flexible Coupling Co., Westfield, N. Y.

CRANE LUBRICATING SYSTEMS

Blaw-Knox Co., Farmers Bank Bldg., Pittsburgh, Pa.

CRANES (Bucket)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Electric Tramrail)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Robbins & Myers, Inc., Springfield, Ohio.

CRANES (Electric Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div., of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Erie Steel Construction Co., Erie, Pa.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Gantry)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Wellman Engineering Co., 7000 Central Ave., Cleveland 4, O.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Hand Traveling)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc. Springfield, Ohio.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Jib)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CRANES (Monorail)

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.

CRANES (Monorail) (Cont'd.)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Modern Equipment Co., Port Washington, Wis.
Northern Engineering Works, 2615 Atwater, Detroit 7, Mich.
Shepard-Niles Crane & Hoist Corp., 360 Schuyler Ave., Montour Falls, N. Y.

CRANES (Self-Propelled)

Hughes-Keenan Co., Mansfield, Ohio
Orton Crane & Shovel Co., 608 So. Dearborn, Chicago, Ill.
Silent Hoist & Crane Co., 835 63rd St., Brooklyn 20, N. Y.

CRANES (Traction or Tractor)

Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

CRUCIBLES

American Crucible Co., North Haven, Conn.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Dixon, Joseph, Crucible Co., Jersey City, N. J.
Lava Crucible Co., Pittsburgh, Pa.
National Crucible Co. Mermaid Lane and Queen Sts., Philadelphia 18, Pa.
Ross-Tacony Crucible Co., Tacony, Philadelphia, Pa.
Vesuvius Crucible Co., Swissvale, Pa.

CRUCIBLE FURNACES

Ajax Electrothermic Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

CRUCIBLE LIFTERS

Modern Equipment Co., Port Washington, Wis.

CRUCIBLE POURING DEVICES

Modern Equipment Co., Port Washington, Wis.

CRUSHERS (Core)

Simplicity Engineering Co., Durand, Mich.

CUPOLAS

Modern Equipment Co., Port Washington, Wis.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Roots-Connersville Blower Corp., Connersville, Ind.
Spencer Turbine Co., Hartford, Conn.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CHARGING MACHINES

American MonoRail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, O.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Modern Equipment Co., Port Washington, Wis.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUPOLA CONTROL EQUIPMENT

Foxboro Company, Foxboro, Mass.

CUPOLA DUST ARRESTORS

Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

CUPOLA LININGS

Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.
A. P. Green Fire Brick Co., Mexico, Missouri
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio.
United States Graphite Co., Saginaw, Mich.

CUPOLA PRESSURE VALVES

Norwalk Valve Co., S. Norwalk, Conn.

CUPOLA SPARK ARRESTORS

Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

CUTOFF MACHINES (Abrasive)

Fox Grinders Inc., Oliver Bldg., Pittsburgh, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

DARK ROOM ACCESSORIES (X-Ray)

Eastman Kodak Co., Rochester, N. Y.

DARK ROOM PROCESSING (Chemical Tanks, etc.)

Eastman Kodak Co., Rochester, N. Y.

DEGASIFIERS

Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Metalloy Corp., Rand Tower, Minneapolis 2, Minn.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

DENSIFIED WOOD

Parkwood Corp., Wakefield, Mas.

DEOXIDIZERS

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
Ajax Metal Co., 46 Richmond St., Philadelphia 23, Pa.
Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Metalloy Corp., Rand Tower, Minneapolis 2, Minn.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.

DEOXIDIZERS (Ferrous)

Carborundum Co., Perth Amboy, N. J.

DESULPHURIZERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E 42nd St., New York 17, N. Y.
Modern Equipment Co., Port Washington, Wis.

DESULPHURIZERS (Cont'd.)

Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DIE CASTING MACHINES

Cleveland Automatic Machine Co., 4932 Beech St., Cincinnati 12, O.
Hydraulic Press Mfg. Co., Mount Gilead, Ohio.
Kux Machine Co., 3930 W. Harrison St., Chicago 24, Ill.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Miller-Taylor Tool Co., 5005 Euclid Ave., Cleveland 3, Ohio

DIES

City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio

DIRECT FIRED HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

DOWEL PINS

Standard Horse Nail Corp., New Brighton, Pa.

DRILLS (Pneumatic)

Gardner-Denver Co., Quincy, Ill.
Schramm Inc., West Chester, Pa.

DRIVES (Reciprocating)

Ajax Flexible Coupling Co., Westfield, N. Y.

DRUMS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

DUMP HOPPERS

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

DUMP TRUCKS

Bell Aircraft Corp., Niagara Falls, N. Y.
Frank G. Hough Co., Libertyville, Ill.

DUST ARRESTING EQUIPMENT

American Air Filter Co., Inc., 266 Central Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Schmieg Industries, 302 Piquette St., Detroit 2, Mich.
Schneible Co., Claude B., 2827-25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

DUST COLLECTORS

Pangborn Corp., Hagerstown, Md.
Schmeig Industries, 302 Piquette, Detroit 2, Mich.
Claude B. Schneible Co., 2827 25th St., Detroit 16, Mich.

DUST COLLECTORS (Shake-out)

Newcomb-Detroit Co., Inc., 5741 Russell St., Detroit 11, Mich.
Pangborn Corp., Hagerstown, Md.

DUST CONTROL (Chemical)

Johnson March Corp., 1724 Chestnut St., Philadelphia, Pa.
Pangborn Corp., Hagerstown, Md.

DUST RECOVERY SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Kirk & Blum Mfg. Co., Cincinnati 25, O.
Pangborn Corp., Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.

ELECTRIC FURNACES (see Furnaces, Electric)

ELECTRODES (Graphite and Amorphous)

International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co., Inc., Electrode Sales Div., 30 E. 42nd St., New York 17, N. Y.

ELEVATORS

Standard Conveyor Co., North St. Paul 9, Minn.

ELEVATORS (Bucket)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.

ELEVATORS (Material Handling)

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

ELEVATORS (Pneumatic, Material Handling)

Fuller Co., Catasauqua, Pa.

ENGINEERING SERVICE (Foundry)

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
A. H. Putnam Co., 1319 2nd Ave., Rock Island, Ill.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.
Wickland Co., A. A., 205 W. Wacker Dr., Chicago 6, Ill.

ENGINEERING SERVICE (Permanent Mold)

Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio

EXHAUST SYSTEMS

American Air Filter Co., Inc., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corporation, Hagerstown, Md.
Parsons Engineering Corp., 2545 E. 79th St., Cleveland 4, O.
Propellair Inc., Springfield, O.
Schmeig Industries, 302 Piquette, Detroit 2, Mich.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.

FABRICATORS (Metal)

Roura Iron Works, 1405 Woodland Ave., Detroit 11, Mich.

FACINGS

Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Pacific Graphite Works, 40th & Linden Sts., Oakland 8, Calif.
Stevens Inc., Frederic B., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

FANS (Ventilating, Exhaust, Cooling, etc.)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, O.

FEEDERS (Rotary)

Fuller Company, Catasauqua, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Newaygo Engineering Co., Newaygo, Mich.

FEEDERS (Sand)

Bartlett & Snow Co., C. O., 6201 Harvard Ave., Cleveland 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

FERROBORON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROCHROME

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Hickman-Williams & Co., Cleveland, O.
Ohio Ferro-Alloys Corp., Canton 2, O.
Vanadium Corp., of America, 420 Lexington Ave., New York, N. Y.

FERROCOLUMBIUM

Electro Metallurgical Sales Corp., 43 E. 42nd St., New York 17, N. Y.

FERROMANGANESE

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Ohio Ferro-Alloys Corp., Canton 2, O.
Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.

FERROMOLYBDENUM

Climax Molybdenum Co., 500 Fifth Ave., New York 18, N. Y.
Molybdenum Corporation of America, Pittsburgh 19, Pa.

FERROPHOSPHOROUS

Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.

FERROSILICON

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Globe Iron Co., Jackson, Ohio

FERROSILICON (Cont'd.)

Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Cnicago 4, Ill.
Ohio Ferro-Alloys Corp., Canton 2, O.
Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTITANIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FERROTUNGSTEN

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Molybdenum Corp. of America, Pittsburgh 19, Pa.

FERROVANADIUM

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.
Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

FILM (X-Ray)

Eastman Kodak Co., Rochester, N. Y.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

FILTERS (Air)

American Air Filter Co., 266 Central Ave., Louisville 8, Ky.

FIRE BRICK

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Norton Co., Worcester 6, Mass.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio
Stevens Inc., Frederic B., Detroit 16, Mich.
Chas. Taylor Sons Co., P.O. Box 58, Annex Sta., Cincinnati 14, Ohio

FIRE CLAY

Eastern Clay Products, Inc., Jackson, O.
A. P. Green Fire Brick Co., Mexico, Missouri
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Illinois Clay Products Co., Joliet, Ill.
Ironton Fire Brick Co., Ironton, O.
Robinson Clay Product Co., 1100 Second National Bldg., Akron, Ohio
Chas. Taylor Sons Co., P.O. Box 58, Annex Sta., Cincinnati 14, Ohio

FIRE SAND

Carborundum Co., Niagara Falls, N. Y.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FIRESTONE

Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

FLASK BANDS

Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio

FLASK BUSHINGS

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASK PINS

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Universal Engineering Co., Frankenmuth, Mich.

FLASKS (Adjustable)

C. S. Humphrey Co., 249 2nd St., Moline, Ill.

FLASKS (Aluminum)

Adams Co., Dubuque, Iowa
Foundry Service Co., Birmingham, Ala.
Fremont Flask Co., Fremont, O.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASKS (Dowmetal)

Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.

FLASK FILLERS

Bartlett & Snow, C. C., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill
Jeffrey Mfg. Co., Columbus 16, O.

FLASKS (Slip)

Adams Co., Dubuque, Iowa.
Fremont Flask Co., Fremont, O.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

FLASKS (Snap)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div. Rockwell Mfg. Co., Freeport, Ill.
Fremont Flask Co., Fremont, O.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio
Stevens, Inc., Frederic B., Detroit 16, Mich.

FLASKS (Steel)

Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 6, Mo.
Foundry Service Co., Birmingham, Ala.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio

FLASK FITTINGS

Adams Co., Dubuque, Iowa
Black, Sivalls & Bryson, Inc., 720 Delaware, Kansas City 3, Mo.
Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
General Foundry Service Corp., 516 23rd Ave., Oakland 6, Calif.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio
Shanafelt Mfg. Co., 3623 Winfield Way, N. E., Canton 5, Ohio
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio

FLASK LIFT MACHINES

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
The Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

FLASK LUMBER

Dougherty Lumber Co., 4300 E. 66th St., Cleveland 5, O.
Rietz Lumber Co., 1800 N. Central Park Ave., Chicago, Ill.

FLASKS (Wood)

Adams Co., Dubuque, Iowa
Chicago Mfg. & Distributing Co., 1928 W. 16th St., Chicago 9, Ill.

FLEXIBLE SHAFT MACHINERY

Stow Mfg. Co., Binghamton, N. Y.

FLOORING (Non-Slip)

Norton Co., Worcester 6, Mass.

FLUXES

American-British Chemical Supplies Inc., 180 Madison Ave., New York 16, N. Y.
Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Cleveland Flux Co., 1026 Main St., Cleveland 13, O.
Foundry Services, Inc., 280 Madison Ave., New York 16, N. Y.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.
National Pigment Co., East York St., Philadelphia, Pa.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Pittsburgh Metals Purifying Co., 1352 Marvista St., Pittsburgh 12, Pa.
Puro-Seal Co., 414 Swetland Bldg., Cleveland 13, Ohio
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

FLUXES (Soldering, Welding & Tinning)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

FOUNDRY CONSULTANTS

A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill.

FOUNDRY ENGINEERS

A. A. Wickland Co., 205 W Wacker Dr., Chicago 6, Ill.

FOUNDRY LAYOUT & METHODS

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
A. A. Wickland Co., 205 W. Wacker Dr., Chicago 6, Ill.

FOUNDRY NAILS

Standard Horse Nail Corp., New Brighton, Pa.

FOUNDRY SHOVELS
(See SHOVELS)

FOUNDRY SUPPLY HOUSES

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio
Combined Supply & Equipment Co. Inc., 215 Chandler St., Buffalo 7, N. Y.
Eastern Clay Products, Inc., Jackson, O.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Freeman Supply Co., 1152 E. Broadway, Toledo 5, O.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Stevens, Inc., Frederic B., Detroit 16, Mich.

FURNACES (Aluminum & Magnesium Billets)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio

FURNACES (Aluminum & Magnesium Forgings)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio

FURNACES (Aluminum Melting)

Ajax Engineering Corp., Trenton, N. J.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.

FURNACES (Aluminum Rivet Heating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.

FURNACES (Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Despatch Oven Co., Minneapolis 14, Minn.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Electric Furnace Co., Salem, Ohio
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., Fisher Furnace Div. 2450 West Hubbard, Chicago 12, Ill.
Surface Combustion Corp., Toledo 7, Ohio

FURNACES (Crucible Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., 300-320 Moore St., Harrison, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

FURNACES (Electric Melting)

Ajax Electric Furnace Corp., 46 Richmond St., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.

FURNACES (Electric Melting) (Cont'd.)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Gas or Oil Fired)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
Surface Combustion Corp., Toledo 7, Ohio

FURNACES (Gray Iron Melting)

American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.

FURNACES (Heat Treating)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.

FURNACES, HEAT TREATING (Electric)

Ajax Electric Co., Inc., Philadelphia 23, Pa.
Ajax Electrothermic Corp., Trenton, N. J.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

FURNACES (Induction Heating)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.

FURNACES (Malleable Annealing)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
General Electric Co., Schenectady, N. Y.
Lindberg Engineering Co., Fisher Furnace Div. 2450 West Hubbard, Chicago 12, Ill.
Surface Combustion Corp., Toledo 7, Ohio
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Malleable Melting)

American Bridge Co., Pittsburgh 19, Pa.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.

FURNACES (Malleable Melting) (Cont'd.)

Surface Combustion Corp. Toledo 7, Ohio.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Nonferrous Melting)

Ajax Electrothermic Corp., Trenton, N. J.
Ajax Engineering Corp., Trenton, N. J.
Ajax Metal Co., Philadelphia 23, Pa.
Campbell-Hausfeld Co., Harrison, O.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Park, Ill.
Surface Combustion Corp., Toledo 7, Ohio
Swindell-Dressler Corp., Pittsburgh, Pa.

FURNACES (Powdered Coal)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

FURNACES (Steel Melting)

Ajax Electrothermic Corp. Trenton, N. J.
American Bridge Co., Pittsburgh 19, Pa.
Detroit Electric Furnace Div. of Kuhlman Electric Co., Bay City, Mich.
Pittsburgh Lectromelt Furnace Corp., P. O. Box 1125, Pittsburgh, Pa.
Swindell-Dressler Corp., Pittsburgh, Pa.

FURNACE BLOWERS

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Campbell-Hausfeld Co., Harrison, O.
Eclipse Fuel Engineering Co., 711 So. Main St., Rockford, Ill.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Roots-Connersville Blower Corp., Connersville, Ind.

FURNACE LININGS

Campbell-Hausfeld Co., Harrison, O.
Carborundum Co., Perth Amboy, N. J.
A. P. Green Fire Brick Co., Mexico, Missouri.
Ironton Fire Brick Co., Ironton, O
Lindberg Engineering Co., Fisher furnace Div., 2450 West Hubbard, Chicago 12, Ill.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.
United States Graphite Co., Saginaw, Mich.

GAGES

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

GAGGERS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Wadsworth Equipment Co., 2457 Mogadore Rd., Akron, Ohio

GAS (Oxygen, Acetylene, Industrial)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

GAS BURNERS

Fisher Furnace Co., 2543 West Hubbard St., Chicago 12, Ill.

GENERATORS (Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

GLOVES (Industrial, Safety)

American Optical Co., Southbridge, Mass.
C. Walker Jones Co., 6135 Lambert St., Philadelphia 38, Pa.
Richmond Glove Corp., Richmond, Ind.

GOGGLES and EYE PROTECTORS

American Optical Co., Southbridge, Mass.
Chicago Eye Shield Co., 2300 West Warren, Chicago 12, Ill.
Mine Safety Appliances Co., Braddock, Thomas and Meade Sts., Pittsburgh 8, Pa.
Wilson Products Inc., Reading, Pa.

GRAPHITE

Acheson Colloids Corp., Port Huron Mich.
Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
International Graphite & Electrode Corp., St. Marys, Pa.
National Carbon Co. Inc., Carbon Products Div., 30 E. 42nd St., New York 17.
United States Graphite Co., Saginaw, Mich.

GRINDERS (Electric Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
U. S. Electrical Tool Co., Cincinnati 4, O.

GRINDERS (Flexible Shaft)

Stow Mfg. Co., Binghamton, N. Y.

GRINDERS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Tex.
Independent Pneumatic Tool Co., Aurora, Ill.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.

GRINDERS (Surface, Bench, Disc., Floor)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.
Independent Pneumatic Tool Co., Aurora, Ill.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.
Standard Electrical Tool Co., 2488 Riverside Ave., Cincinnati 4, Ohio.
U. S. Electrical Tool Co., Cincinnati 4, O.
Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDERS (Swing Frame)

Fox Grinders, Inc., Oliver Bldg., Pittsburgh 22, Pa.

GRINDERS (Swing Frame) (Cont'd.)

Vonnegut Moulder Corp., 1815 Madison Ave., Indianapolis 2, Ind.

GRINDING WHEELS—See ABRASIVE WHEELS

GRINDING WHEEL DRESSERS

Carborundum Co., Niagara Falls, N. Y.
Desmond-Stephan Mfg. Co., Urbana, O.

GRINDSTONES

Bay State Abrasive Products Co., Westboro, Mass.
Sterling Grinding Wheel Div., Cleveland Quarries Co., 1740 E. 12th St., Cleveland, O.

GRIT (Abrasive)

Alloy Metal Abrasive Co., Ann Arbor, Mich.
American Steel Abrasives Co., Galion, O.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carborundum Co., Niagara Falls, N. Y.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, Ohio.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.

-HAMMERS (Chipping)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Independent Pneumatic Tool Co., Aurora, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Schramm Inc., West Chester, Pa.

HARDNESS TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Steel City Testing Machines Inc., 8843 Livernois Ave., Detroit 4, Mich.

HEAT CONTROL AND RECORDING DEVICES

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.

HEATERS (Gas, Oil, Electric)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HEATERS (Gas, Oil, Electric)

Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.

HEATERS (High Frequency Electric)

Ajax Electrothermic Corp., Trenton, N. J.

HEATERS (Indirect Fired)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio

HEATERS (Space, Unit, Direct Fired)

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

HEATERS (Space, Unit, Oven, Water)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

HELMETS (Blasting)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Optical Co., Southbridge, Mass.
Mine Safety Appliance Co., Braddock, Thomas & Meade Sts., Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.
W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, O.

HELMETS (Welding)

American Optical Co., Southbridge, Mass.

HOISTS (Air)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.

HOISTS (Chain)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio

HOISTS (Electric)

Chisholm-Moore Hoist Corp and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Modern Equipment Co., Port Washington, Wis.
Reading Chain & Block Corp., 2108 Adams St., Reading, Pa.
Robbins & Myers, Inc., Springfield, Ohio.
Shepard-Niles Crane & Hoist Corp., Montour Falls, N. Y.

HOIST (Electric) (Cont'd.)

Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

HOISTS (Hand)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio
David Round & Sons, Broadway & Henry Sts., Cleveland 5, Ohio

HOPPERS (Sand)

Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

HOSE (Air, Blasting, Water, Gas)

Gardner-Denver Co., Quincy, Ill.
Hewitt Rubber Div. Hewitt-Robins Div., Inc., 240 Kinsington Ave., Buffalo 5, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Pangborn Corp., Hagerstown, Md.
Raybestos-Manhattan, Inc., Manhattan Rubber Div., Passaic, N. J.
Schramm Inc., West Chester, Pa.

HYDRAULIC CLEANING EQUIPMENT

Hydro-Blast Corp., 2050 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.

HYDRO FINISHING EQUIPMENT

Pangborn Corp., Hagerstown, Md.

ILLUMINATORS (X-Ray Film)

Eastman Kodak Co., Rochester, N. Y.

IMPREGNATING SYSTEMS

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

INDUSTRIAL ENGINEERING SERVICE

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.
Westover Engineers, 424 E. Wells St., Milwaukee 2, Wis.

INGOT MOLDS

Acme Foundry Co., Detroit 16, Mich.

INGOTS (Nonferrous)

Ajax Metal Co., Philadelphia 23, Pa.
American Smelting and Refining Co., 120 Broadway, New York 5
Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.
Cleveland Electro Metals Co., W. 38th St. & NP R.R. Cleveland 13, O.
Federated Metals Div., American Smelting and Ref. Co., New York 5
International Nickel Co., Inc., 67 Wall St., New York City 5
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.
Northwestern Iron & Metal Co., 3225 S. 30th St., Lincoln, Nebraska
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.
Sonken-Galamba Corp., Kansas City 18, Kansas
Western Metals Co., 3201 So. Kedzie Ave., Chicago 23, Ill.

INJECTION MOLDING MACHINES

Lester-Phoenix Inc., 2711 Church St., Cleveland 13, Ohio
W. McGeough, Milwaukee 7, Wis.

INOCULANTS

Carborundum Co., Perth Amboy, N. J.

IRON CEMENT

Smooth-On Mfg. Co., 570 Communipaw Ave., Jersey City 4, N. J.

IRON ORE

Pickands, Mather & Co., Cleveland 14, O.

IRON OXIDES

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Delta Oil Products Co., Milwaukee 9, Wis.

JACKETS (Mold)

Adams Co., Dubuque, Iowa
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.

LABORATORY EQUIPMENT (Chemical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Laboratory Equipment Corp., St. Joseph, Mich.
National Spectrographic Laboratories Inc., 6300 Euclid Ave., Cleveland, Ohio.

LABORATORY EQUIPMENT (Physical)

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Laboratory Equipment Corp., St. Joseph, Mich.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Norton Co., Worcester 6, Mass.

LADLES

Foundry Service Co., Birmingham, Ala.
Industrial Equipment Co., Minster, O.
Industrial Fabricating, Inc., 817 Hall St., Eaton Rapids, Mich.
Modern Equipment Co., Port Washington, Wis.
Frederic B. Stevens, Inc., Detroit 16, Mich.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

LADLE LININGS

A. P. Green Fire Brick Co., Mexico, Missouri
Harbison-Walker Refractories Co., 1745 Farmers Bank Bldg., Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, Ohio

LATHE CENTERS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

LEAD

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5.

LINSEED OIL

Hercules Powder Co., Wilmington 99, Del.

LOADERS

Clearfield Machine Co., Clearfield, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.

LOADERS (Tractor-Mounted)

Frank G. Hough Co., Libertyville, Ill.

LUBRICANTS (Industrial)

Acheson Colloids Corp., Port Huron, Mich.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill. New York 26, N. Y.
United States Graphite Co., Saginaw, Mich.

LUMBER (All kinds)

Dougherty Lumber Co., 4300 East 68th St., Cleveland 5, Ohio.

MACHINE KEYS

Standard Horse Nail Corp., New Brighton, Pa.

MACHINERY MOUNTING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

MAGNESIUM (Ingots)

Apex Smelting Co., 2537 West Taylor St., Chicago 12, Ill.

MAGNET CONTROLLERS

Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio

MAGNETS

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

MANGANESE (Briquets)

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

MATCHPLATES

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Central Pattern Co. Quincy, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3, O.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.

MATERIALS HANDLING EQUIPT.

Frank G. Hough Co., Libertyville, Ill.
Hughes-Keenan Co., Mansfield, Ohio.
Orton Crane & Shovel Co., 608 So. Dearborn, Chicago, Ill.

MATERIALS HANDLING DESIGN

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.

MATERIALS HANDLING (Hoists)

Chisholm-Moore Hoist Corp. and Columbus-McKinnon Chain Corp., Tonawanda, N. Y.

MECHANICAL ENGINEERS

Frank D. Campbell, 332 So. Michigan Ave., Chicago, Ill.
Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.
Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

MELTING POTS

Acme Foundry Co., Detroit 16, Mich.

METAL CLEANING EQUIPMENT

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.

METALLOGRAPHIC EQUIPMENT

Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.

METALLURGISTS

Crobaugh Co., Frank L., 1426 West Third St., Cleveland 13, Ohio.

METERS (Gas, Air, Water)

Roots-Connersville Blower Corp., Connersville, Ind.

MIXERS (Core Wash)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

MIXERS (Sand and Clay)

American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Blystone Division, Standard Sand & Machine Co., 549 W. Washington St., Chicago 6, Ill.
Clearfield Machine Co., Clearfield, Pa.
Construction Machinery Co., Waterloo, Iowa.
Fordath Enginering Co. Ltd., West Bromwich, Birmingham, England.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co., Kingston, Pa.
Sather Mfg. Co., Everett, Wash.

MODELS (Wood)

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.

MOLD BOARDS

Parkwood Corp., Wakefield, Mass.

MOLD CONVEYORS

Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Chain Belt Co., 1671 W. Bruce St., Milwaukee 4, Wis.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., Wickliffe, Ohio.
Jeffrey Mfg. Co., 907-99 N. Fourth St., Columbus 16, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.

MOLD CONVEYORS (Cont'd)

Logan Co., 580 Cabel, Louisville, Ky.
Mathews Conveyer Co., Ellwood City, Pa.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Newaygo Engineering Co., Newaygo, Mich.

MOLD DRYERS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

MOLD OVENS and DRYERS

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, O.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N. Y.

MOLD TRUCKS (Power Operated)

Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.

MOLD WASH

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
National Carbon Co., Inc., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.
United States Graphite Co., Saginaw, Mich.

MOLDERS BENCHES

Western Tool & Mfg. Co., Springfield, Ohio.

MOLDING MACHINES

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Beardsley & Piper Co., The 2424 N. Cicero, Chicago 39, Ill.
British Moulding Machine, Faverham, Kent, England
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport, Machine & Foundry Co., Davenport, Iowa.
Foundry Service Co., Birmingham, Ala.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Moline Iron Works, Moline, Ill.
Nichols, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Jolt)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLD MACHINE MOUNTING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

MOLDING MACHINE (Repairing)

Standard Pattern Works, 13781 Concord, Detroit 12, Mich.

MOLDING MACHINES (Rollover)

Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, O.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING MACHINES (Squeeze)

Adams Co., Dubuque, Iowa.
Arcade Manufacturing Div., Rockwell Mfg. Co., Freeport, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
International Molding Machine Co., LaGrange Park, Ill.
Johnston & Jennings Co., 867 Addison Rd., Cleveland 14, O.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.
Moline Iron Works, Moline, Ill.
Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

MOLDING SANDS

Great Lakes Foundry Sand Co., United Artists Bldg., Detroit 26, Mich.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

MOLYBDENUM

Molybdenum Corporation of America, Pittsburgh 19, Pa.

MONORAIL SYSTEMS

American Monorail Co., 13104 Athens Ave., Cleveland 7, O.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link-Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

MOTORS (Electric)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Ohio Electric Mfg. Co., 5906 Maurice Ave., Cleveland, Ohio.

MOUNTING PADS, MOLDING AND SHAKEOUT MACHINES

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

NAILS (Chill)

Angell Nail & Chaplet Co., 4580 E. 71st St., Cleveland 5, O.
Republic Steel Corp, 3100 E. 45th St., Cleveland 4, Ohio.
Standard Horse Nail Corp., New Brighton, Pa.

NICKEL

International Nickel Co., Inc., 67 Wall St., New York City 5.

NITROGEN

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.

NOZZLES (Blasting)

Alloy Metal Abrasives Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., 505 S. Byrkit St., Mishawaka, Ind.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 7st St., Cleveland 5, O.
Norton Co., Worcester 6, Mass.
Pangborn Corp., Hagerstown, Md.
W. W. Sly, Mfg. Co., 4753 Train Ave., Cleveland 2, O.

OIL BURNERS

Hauck Manufacturing Co., 106 Tenth St., Brooklyn 15, N. Y.
Lindberg Engineering Co., Fisher Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Stroman Furnace & Engineering Co., Div. of Peterson Oven Co., 9900 Franklin Ave., Franklin Park, Ill.

OVENS (Annealing and Heat Treating)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Electric Furnace Co., Salem, Ohio.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Company, 750 Prospect Ave., Cleveland 15, O.
Lindberg Engineering Co., Fisher Furnaces Div., 2450 West Hubbard, Chicago 12, Ill.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

OVENS (Core) (See CORE OVENS)

OVENS (Enameling, Japanning)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

OVENS (Mold)

Carl-Mayer Corp., 3030 Euclid Ave., Cleveland 15, Ohio.
Despatch Oven Co., Minneapolis 14, Minn.
Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.
Lanly Co., 750 Prospect Ave., Cleveland 15, Ohio.

OXYGEN

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

PAINT (Rust Proof)

Speco Inc., 7308 Associate Ave., Cleveland, Ohio.

PARTING COMPOUNDS

Buckeye Products Co., 7022 Vine St., Cincinnati 16, Ohio.
Delta Oil Products Co., Milwaukee 9, Wis.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Smith Oil & Refining Co., 1102 Kilburn Ave., Rockford, Ill.

—When writing advertisers, please mention THE FOUNDRY—

PARTING COMPOUNDS (Cont'd.)

Frederic B. Stevens, Inc., Detroit 16, Mich.
E. F. Houghton Co., 303 W. Lehigh Ave., Philadelphia 33, Pa.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.
Thiem Products Co., 9800 West Rogers, Milwaukee 14, Wis.

PATTERN ADHESIVES

National Starch Products Inc., 270 Madison Ave., New York 16, N.Y.

PATTERN BOARD STOCK

Parkwood Corp., Wakefield, Mass.

PATTERN COATINGS

American Lacquer Solvents Co., Phoenixville, Pa.

PATTERN COMPOUND

Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

PATTERN LETTERS

Freeman Supply Co., Toledo 5, O.

PATTERN LUMBER

Dougherty Lumber Co., Cleveland 5, O.
Freeman Supply Co., Toledo 5, O.
Rietz Lumber Co., 1800 N. Central Park Ave., Chicago, Ill.

PATTERN PLATES

Accurate Match Plate Co., 1847 W. Caroll St., Chicago, Ill.
Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.
Central Pattern Co., Quincy, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Foundry Service Co., Birmingham, Ala.
Freeman Supply Co., Toledo 5, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Plaster Process Castings Co., 6922 Carnegie Ave., Cleveland 3.
Scientific Cast Products Corp., 1388-92 E. 40th St., Cleveland 3, O.

PATTERN PLATE STOCK

Freeman Supply Co., 1152 Broadway, Toledo 5, O.

PATTERN SHOP EQUIPMENT

Buss Machine Works, 201 West 8th St., Holland, Mich.
DoAll Company, Des Plaines, Ill.
Freeman Supply Co., 1152 East Broadway, Toledo 5, Ohio.
Oliver Machinery Company, Grand Rapids 2, Mich.
Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.

PATTERN SUPPLY HOUSES

Freeman Suppy Co., 1152 East Broadway, Toledo 5, Ohio.

PATTERNS

Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.

PATTERNS (PLASTIC)

Central Pattern Co., Quincy, Ill.
Plastic Corp. of Chicago, 2444 So. Central Ave., Cicero 50, Ill.

PATTERNS (Wood, Metal)

Accurate Match Plate Co., 1847 W. Carroll St., Chicago, Ill.
Buffalo Pattern Works, 830 Hertel Ave., Buffalo, N. Y.
Central Pattern Co., Quincy, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
City Pattern Foundry & Machine Co., 1161 Harper Ave., Detroit 11, Mich.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Industrial Pattern Works, 2621 Belmont Ave., Chicago 18, Ill.
Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.
S. P. O. Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Wellman Bronze & Aluminum Co., 2225 E. 93rd St., Cleveland 4, O.

PERMANENT MOLD COATINGS

Acheson Colloids Corp., Port Huron, Mich.

PERMANENT MOLDS

Master Pattern Co., 1315 Main Ave., Cleveland, Ohio.
Rossborough Supply Co., 1456 W. 9th St., Cleveland 13, O.

PHOTOGRAPHIC EQUIPMENT

Eastman Kodak Co., Rochester, N. Y.

PHOTOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.

PIG IRON

Globe Iron Co., Jackson, Ohio.
Jackson Iron & Steel Co., Jackson, Ohio.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.
Pickands, Mather & Co., Cleveland 14, O.
Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.
Tennessee Products & Chemical Corp., American National Bank Bldg., Nashville 3, Tenn.
Woodward Iron Co., Woodward, Ala.

PIG IRON (Silvery)

Globe Iron Co., Jackson, Ohio.
Jackson Iron & Steel Co., Jackson, O.
Keokuk Electro Metals Co., 429 So. 4th St., Keokuk, Iowa.
Miller & Company, 332 S. Michigan Ave., Chicago 4, Ill.

PINS (Flask)

Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.
Shanafelt Mfg. Co., 3623 Winfield Way, N.E., Canton 5, Ohio.
Sterling Wheelbarow Co., 7100 W. Walker St., Milwaukee 14, Wis.
Truscon Steel Co., Pressed Steel Div., 6100 Truscon Ave., Cleveland, Ohio.
Universal Engineering Co., Franknenmuth, Mich.

PISTON RINGS (for Molding Machines, Compressors, etc.)

Nicholls, Wm. H., Co., Richmond Hill, Long Island 18, N. Y.

PLANT ENGINEERING SERVICE

Giffels & Vallet, Inc., Marquette Bldg., Detroit, Mich.

PLANT ENGINEERING SERVICE (Cont'd.)

Lester B. Knight & Associates, Inc., 600 West Jackson Blvd., Chicago 3, Ill.

PLATES (Bottom)

Adams Co., Dubuque, Iowa.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

PLATES (Core Drying)

Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Johns-Manville, 22 East 40th St., New York City 16.

PLATING TEMPERATURE CONTROLS

Foxboro Company, Foxboro, Mass.

PLUMBAGO

Bloomsbury Graphite Co., Bloomsbury, N. J.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Frederic B. Stevens, Inc., Detroit 16, Mich.
United States Graphite Co., Saginaw, Mich.

PNEUMATIC TOOLS

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co., Dayton 1, Ohio.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Master Pneumatic Tool Co., Inc., Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm Inc., West Chester, Pa.

POURING DEVICES

Modern Equipment Co., Port Washington, Wis.
Whiting Corp., 15607 Lathrop Ave., Harvey, Ill.

PRESSER BOARDS

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

PRESSES (Hydraulic)

Hydraulic Press Mfg. Co., Mount Gilead, Ohio.

PRESSURE CASTING SEALER

Empire Varnish Co., 2636 E. 76th St., Cleveland 4, O.

PRESSURE RECORDERS

Foxboro Company, Foxboro, Mass.

PULLEYS (Magnetic)

Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

PUMPS

Construction Machinery Co., Waterloo, Iowa.
Gardner-Denver Co., Quincy, Ill.

PUMPS (Dry, Vacuum)

Allis Chalmers Mfg. Co., Milwaukee 1, Wis.
Fuller Company, Catasauqua, Pa.
Roots-Connersville Blower Corp., Connersville, Ind.

PURIFIERS

Cleveland Flux Co., 1026 Main St., Cleveland 13, O.

PUSH-OFF MACHINES

Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Co., 3238 W. Pierce St., Milwaukee 4, Wis.

PUTTY (Foundry)

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.

PYROMETERS

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
Marshall Co., L. H., 270 W. Lane, Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

PYROMETERS (Immersion)

Pyrometer Instrument Co., Bergenfield, N. J.

PYROMETERS (Optical)

Pyrometer Instrument Co., Bergenfield, N. J.

RACKS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

RADIOGRAPHY (Industrial)

Eastman Kodak Co., Rochester, N. Y.
Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

RADIUM

Radium Chemical Co., Inc., 570 Lexington Ave., New York 22, N. Y.

RAMMERS

Independent Pneumatic Tool Co., Aurora, Ill.

REFRACTORIES

Babcock & Wilcox Co., 85 Liberty St., New York 6, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Carborundum Co., Perth Amboy, N. J.
Cleveland Quarries Co., 1740 E. 12th St., Cleveland 14, O.

—When writing advertisers, please mention THE FOUNDRY—

REFRACTORIES (Cont'd.)

Eastern Clay Products, Inc.
Jackson, O.
Electro Refractories & Alloys Corp.,
Vars Bldg., Buffalo 2, N. Y.
A. P. Green Fire Brick Co.,
Mexico, Missouri
Harbison-Walker Refractories Co.,
1745 Farmers Bank Bldg.,
Pittsburgh 22, Pa.
Ironton Fire Brick Co., Ironton, O.
Lindberg Engineering Co., Fisher
Furnace Div., 2450 West Hubbard, Chicago 12, Ill.
Norton Co., Worcester 6, Mass.
Pennsylvania Foundry Supply &
Sand Co., Ashland & E. Lewis
Sts., Philadelphia 24, Pa.
Robinson Clay Product Co.,
1100 Second National Bldg.,
Akron, Ohio
Frederic B. Stevens, Inc.,
18th St. & Vernor Highway,
Detroit 16, Mich.
Chas. Taylor Sons Co.,
P.O. Box 58, Annex Sta.,
Cincinnati 14, Ohio
United States Graphite Co.,
Saginaw, Mich.

RESPIRATORS

Chicago Eye Shield Co., 2300 West
Warren, Chicago 12, Ill.
Mine Safety Appliances Co.,
Braddock, Thomas and Meade
Sts., Pittsburgh 8, Pa.
Wilson Products Inc., Reading, Pa.

RIDDLES

Chicago Mfg. & Distributing Co.,
1928 W. 46th St., Chicago 9, Ill.
Frederic B. Stevens, Inc.,
18th St. & Vernor Highway,
Detroit 16, Mich.

RIDDLES (Electric)

Champion Foundry & Machine Co.,
1553 West Madison St.,
Chicago 7, Ill.
Federal Foundry Supply Co.,
4600 E. 71st St., Cleveland 5, O
Foundry Supplies & Mfg. Co.,
2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co.,
Leavenworth, Kans.
Roller Riddle Corp., P.O. Box 178,
Port Huron, Mich.

RIDDLES (Hand)

Federal Foundry Supply Co.,
4600 E. 71st St., Cleveland 5, O.

ROD DIP

Smith Oil & Refining Co., 7102 Kilburn Ave., Rockford, Ill.

ROD STRAIGHTENERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co.,
4600 E. 71st St., Cleveland 5, O.

RODS (Steel)

Republic Steel Corp., 3100 E. 45th
St., Cleveland 4, Ohio

ROLLER-HEARTH FURNACES (Electric Annealing)

General Electric Co.,
Schenectady, N Y.

RUBBER LINING MATERIAL (Abrasive Resisting)

Pangborn Corp., Hagerstown, Md.

RUST PROOF PAINT

Speco Inc., 7308 Associate Ave.,
Cleveland, Ohio

SAFETY CLOTHING

American Optical Co.,
Southbridge, Mass.
Chicago Eye Shield Co., 2300 West
Warren, Chicago 12, Ill.
C. Walker Jones Co., 6135 Lambert
St., Philadelphia 38, Pa
Mine Safety Appliances Co.,
Braddock, Thomas and Meade Sts.,
Pittsburgh 8, Pa.
Pangborn Corp., Hagerstown, Md.

SALT and SALT TABLETS

Mine Safety Appliances Co.,
Braddock, Thomas and Meade
Sts., Pittsburgh 8, Pa.

SAND (Core, Molding, Blasting)

American Silica Sand Co.,
Ottawa, Ill.
Carpenter Brothers, Inc., 606 West
Wisconsin, Milwaukee 3, Wis.

SAND (Core, Molding, Blasting) (Cont'd.)

Great Lakes Foundry Sand Co.,
United Artists Bldg.,
Detroit 26, Mich.
Pangborn Corp., Hagerstown, Md.
Pennsylvania Foundry Supply &
Sand Co., Ashland & E. Lewis
Sts., Philadelphia 24, Pa.
Producers Core Sand Corp.,
Michigan City, Ind.
Standard Silica Corp., 203 So.
LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn
St., Chicago, Ill.

SAND BLAST BARRELS

American Wheelabrator & Equipment Co., 505 S. Brykit St.,
Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill
Pangborn Corp., Hagerstown, Md.
Tabor Mfg. Co., 6225 Tacony St.,
Philadelphia 35, Pa.
Sly Mfg. Co., W. W.
4753 Train Ave., Cleveland 2, O.

SAND BLAST CABINETS

American Wheelabrator & Equipment Co., 505 S. Byrkit St.,
Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

SAND BLAST EQUIPMENT

American Air Filter Co., 266 Central
Ave., Louisville 8, Ky.
American Wheelabrator & Equipment Co., 505 S. Byrkit St.,
Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
Tabor Mfg. Co., 6225 Tacony St.,
Philadelphia 35, Pa.
Sly Mfg. Co., W. W.,
4753 Train Ave., Cleveland 2, O.

SAND BLAST NOZZLES

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Federal Foundry Supply Co.,
4600 E. 71st St., Cleveland 5, O.
Norton Company,
Worcester 6, Mass.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W.,
4753 Train Ave., Cleveland 2, O.

SAND BLAST ROOMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W.
4753 Train Ave., Cleveland 2, O.

SAND BLAST TABLES

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.
Sly Mfg. Co., W. W.,
4753 Train Ave., Cleveland 2, O.

SAND BLAST CONDITIONERS

Beardsley & Piper Co.,
2424 No. Cicero,
Chicago 39, Ill.

SAND CONDITIONING (Chemical)

Johnson March Corp.,
1724 Chestnut St.,
Philadelphia, Pa.

SAND CONTROL & TESTING EQUIPMENT

Beardsley & Piper Co.,
2424 No. Cicero,
Chicago 39, Ill.
Harry W. Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.

SAND CONVEYING and HANDLING EQUIPMENT

American Air Filter Co.,
Louisville 8, Ky.
Ajax Flexible Coupling Co.,
Westfield, N. Y.
C. O. Bartlett & Snow Co.,
6201 Harvard Ave.,
Cleveland 5, O.
Beardsley & Piper Co., The,
2424 No. Cicero, Chicago 39, Ill.
Chain Belt Co.,
1671 W. Bruce St.,
Milwaukee 4, Wis.
Clearfield Machine Co.,
Clearfield, Pa.

SAND CONVEYING and HANDLING EQUIPMENT (Cont'd)

Cleveland Tramrail Div. of Cleveland Crane & Engineering Co.,
Wickliffe, Ohio
Frank G. Hough Co.,
Libertyville, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth
St., Columbus 16, O.
Joy Mfg. Co., Joy Division,
Pittsburgh, Pa.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.
Newaygo Engineering Co.,
Newaygo, Mich.
Osborn Mfg. Co., 5401 Hamilton
Ave., Cleveland 14, O.
Penn Iron Works, Reading, Pa.
Royer Foundry & Machine Co.,
Kingston, Pa.

SAND CONVEYING and HANDLING EQUIPMENT (Pneumatic)

Clark Industrial Truck Div. of
Clark Equipment Co., Battle
Creek, Mich.
Fuller Company, Catasauqua, Pa.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave.,
Passaic, N. J.

SAND COOLING SYSTEMS

Newaygo Engineering Co.,
Newaygo, Mich.

SAND DRYERS

Allis-Chalmers Mfg. Co.,
Milwaukee 1, Wis.
Bartlett & Snow Co., C. O.,
6201 Harvard Ave.,
Cleveland 5, Ohio.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
Nichols Engineering & Research
Corp., 60 Wall Tower,
New York 5, N. Y.

SANDERS (Pneumatic)

Cleco Division of Reed Roller Bit
Co., Houston, Texas.

SANDERS (Tapered-Spindles)

Wellman Products Co.,
1444 E. 49th St., Cleveland 3, O.

SANDING MACHINERY (Disc, Spindle, Belt, etc.)

Freeman Supply Co., 1152 E.
Broadway, Toledo 5, Ohio.
Oliver Machinery Company,
Grand Rapids 2, Mich.

SAND MEASURING and WEIGHING DEVICES

Baker Perkins Inc., Saginaw, Mich.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.

SAND MIXERS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Baker Perkins Inc., Saginaw, Mich.
Beardsley & Piper Co., The, 2424
N. Cicero, Chicago 39, Ill.
Blystone Division,
Standard Sand & Machine Co.,
549 W. Washington Blvd.,
Chicago 6, Ill.
Clearfield Machine Co.,
Clearfield, Pa.
Construction Machinery Corp.,
Waterloo, Iowa.
Freeman Supply Co., 1152 E.
Broadway, Toledo 5, Ohio.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.
Royer Foundry & Machine Co.,
Kingston, Pa.

SAND PREPARATION EQUIPMENT

Allis-Chalmers Mfg. Co.,
Milwaukee 1, Wis.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Ajax Flexible Coupling Co.,
Westfield, N. Y.
Baker Perkins Inc., Saginaw, Mich.
Bartlett & Snow Co., C. O., 6201
Harvard Ave., Cleveland 5, O.

SAND PREPARATION EQUIPMENT (Cont'd.)

Beardsley & Piper Co., The, 2424
N. Cicero, Chicago 39, Ill.
Clearfield Machine Co.,
Clearfield, Pa.
Fordath Engineering Co. Ltd., West
Bromwich, Birmingham, England.
Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Jeffrey Mfg. Co., 907-99 N. Fourth
St., Columbus 16, O.
Moulders Friend, Dallas City, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.
Osborn Mfg. Co., 5401 Hamilton
Ave., Cleveland 14, O.
Royer Foundry & Machine Co.,
Kingston, Pa.
Sather Mfg. Co., Everett, Wash.
Simplicity Engineering Co.,
Durand, Mich.

SAND RAMMERS

Chicago Mfg. & Distributing Co.,
1928 W. 46th St., Chicago 9, Ill.
Chicago Pneumatic Tool Co., 6 East
44th St., New York 17, N. Y.
Cleco Pneumatic Tool Div., Reed
Roller Bit Co., Houston, Texas.
Dayton Pneumatic Tool Co.,
Dayton 1, O.
Herman Pneumatic Machine Co.,
Union Bank Bldg.,
Pittsburgh 22, Pa.
Mastern Pneumatic Tool Co., Inc.,
Orwell, Ohio.
Rotor Tool Co., 17325 Euclid Ave.,
Cleveland 12, Ohio.

SAND RECLAIMERS

Hydro-Blast Corp., 2550 N. Western Ave., Chicago 47, Ill.
Jeffrey Mfg. Co., 907 N. Fourth
St., Columbus 16, O.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.
Nichols Engineering & Research
Corp., 60 Wall Tower,
New York 5, N. Y.
Stearns Magnetic Mfg. Co.,
662 S. 28th St., Milwaukee 4, Wis.

SAND SIFTING and SCREENING MACHINERY

Allis-Chalmers Mfg. Co.,
Milwaukee 1, Wis.
American Air Filter Co.,
Louisville 8, Ky.
Bartlett & Snow, C. O., Co.,
6201 Harvard Ave.,
Cleveland 5, Ohio.
Beardsley & Piper Co., The, 2424
N. Cicero, Chicago 39, Ill.
Champion Foundry & Machine Co.,
1553 West Madison St.,
Chicago 7, Ill.
Federal Foundry Supply Co.,
4600 E. 71st St., Cleveland 5, O.
Foundry Supplies & Mfg. Co.,
2221 Orchard St., Chicago 14, Ill.
Great Western Mfg. Co.,
Leavenworth, Kansas.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill
Roller Riddle Corp., P. O. Box 178,
Port Huron, Mich.
Royer Foundry & Machine Co.,
Kingston, Pa.
Simplicity Engineering Co.,
Durand, Mich.
Pangborn Corp., Hagerstown, Md.
Whiting Corporation,
15607 Lathrop Ave., Harvey, Ill.

SAND STORAGE BINS & GATES

Bartlett & Snow, C. O., Co.,
6201 Harvard Ave.,
Cleveland 5, Ohio.
Beardsley & Piper Co., The,
242 No. Cicero, Chicago 39, Ill
Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing
Rd., Chicago 9, Ill.
National Engineering Co., 549 W.
Washington St., Chicago 6, Ill.
Neff & Fry Co., Camden, O.

SANDING MACHINERY (Electric Portable)

Skilsaw, Inc., 5000 N. Elston,
Chicago 30, Ill.

—When writing advertisers, please mention THE FOUNDRY—

SAWS (Band, Metal, Wood)

Atlantic Saw Mfg. Co., New Haven, Conn.
DoAll Company, Des Plaines, Ill.
Oliver Machinery Company, Grand Rapids 2, Mich.

SAWS (Cold Metal)

DoAll Company, Des Plaines, Ill.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

SAWS (Electric Portable)

Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.

SCALING HAMMERS

Independent Pneumatic Tool Co., Aurora, Ill.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Rotor Tool Co., 17325 Euclid Ave., Cleveland 12, Ohio.
Schramm, Inc., West Chester, Pa.

SCRAP

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.

SCREENS (Shake-Out)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, Ohio.
Beardsley & Piper Co., 2424 N. Cicero, Chicago 39, Ill.
Jeffrey Mfg. Co., 907 N. Fourth St., Columbus 16, O.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Simplicity Engineering Co., Durand, Mich.

SCREENS (Vibrating)

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
Ajax Flexible Coupling Co., Westfield, N. Y.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Simplicity Engineering Co., Durand, Mich.

SEA COAL

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.

SEPARATORS (Abrasive)

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Pangborn Corp., Hagerstown, Md.

SEPARATORS (Air, Moisture, Oil)

American Air Filter Co., Louisville 8, Ky.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Jas. A. Murphy & Co., Hamilton, O.
Pangborn Corp., Hagerstown, Md.

SEPARATORS (Magnetic)

Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Dings Magnetic Separator Co., 4740 Electric Ave., Milwaukee 7, Wis.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Stearns Magnetic Mfg. Co., 662 S. 28th St., Milwaukee 4, Wis.

SHAKE-OUT MACHINERY

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
American Air Filter Co., Louisville 8, Ky.
Bartlett & Snow, C. O., Co., 6201 Harvard Ave., Cleveland 5, O.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

SHAKE-OUT MACHINERY (Cont'd.)

Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Productive Equipment Co., 2926 W. Lake St., Chicago 12, Ill.
Robins Conveyors, Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Royer Foundry & Machine Co., Kingston, Pa.
Simplicity Engineering Co., Durand, Mich.

SHAKEOUT MACHINE MOUNTING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

SHOCK ABSORBING PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

SHOT AND GRIT

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Steel Abrasives Co., Galion, O.
Carpenter Brothers, Inc., 606 West Wisconsin, Milwaukee 3, Wis.
Clayton Sherman Abrasives Co., 3896 Lonyo Rd., Detroit 10, Mich.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Foundry Service Co., Birmingham, Ala.
Globe Steel Abrasive Co., Mansfield, O.
Hickman-Williams & Co., Union Commerce Bldg., Cleveland 14, O.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pennsylvania Foundry Supply & Sand Co., Ashland & E. Lewis Sts., Philadelphia 24, Pa.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOT (Peening)

Alloy Metal Abrasive Co., 311 W. Huron St., Ann Arbor, Mich.
American Wheelabrator & Equipment Co., Mishawaka, Ind.
American Steel Abrasive Co., Galion, O.
Cleveland Metal Abrasive Co., 887 E. 67th St., Cleveland, Ohio.
Globe Steel Abrasive Co., Mansfield, Ohio.
Metal Blast, Inc., 871 E. 67th St., Cleveland, Ohio.
National Metal Abrasive Co., 3560 Norton Ave., Cleveland 7, O.
Pangborn Corp., Hagerstown, Md.
Pittsburgh Crushed Steel Co., Pittsburgh 1, Pa.
Steel Shot & Grit Co., Inc., 39 Warren Ave., Boston, Mass.

SHOVELS

Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Frederic B. Stevens, Inc., Detroit 16, Mich.

SHOVELS (Power)

Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.
Frank G. Hough Co., Libertyville, Ill.

SILICA FLOUR

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, O.
Standard Silica Corp., 209 So. LaSalle St., Chicago 4, Ill.
Wedron Silica Co., 38 So. Dearborn St., Chicago, Ill.

SILICOMANGANESE

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

SILICON (Briquets)

Electro Metallurgical Sales Corp., 30 E. 42nd St., New York 17, N. Y.

SILICON CARBIDE (Briquets)

Carborundum Co., Perth Amboy, N. J.

SILVERY PIG IRON see Pig Iron (Silvery)

SKIMMER BARS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.

SKIMMERS

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

SKIP HOISTS

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Gardner-Denver Co., Quincy, Ill.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
National Engineering Co., 549 W. Washington St., Chicago 6, Ill.
Robins Conveyors Div., Hewitt-Robins Inc., 270 Passaic Ave., Passaic, N. J.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

SLIP FLASKS

Adams Co., Dubuque, Iowa.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SLINGS (Chain)

Jeffrey Mfg. Co., Columbus 16, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
S. G. Taylor Chain Co., Hammond, Ind.

SLIP JACKETS

Adams Co., Dubuque, Iowa.
Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Fremont Flask Co., Fremont, O.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SMELTERS & REFINERS

Federated Metals Div.
American Smelting and Refining Co., 120 Broadway, New York 5.
Niagara Falls Smelting & Refining Div., Continental-United Industries Co., Inc., 2204 Elmwood Ave., Buffalo 17, N. Y.

SNAGGING BELTS

Minnesota Mining & Mfg. Co., 900 Fauquier St., St. Paul 6, Minn.

SNAGGING WHEELS—See ABRASIVE WHEELS

SNAP FLASKS

Adams Co., Dubuque, Iowa.
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hines Flask Co., 3431 W. 140th St., Cleveland 11, Ohio.

SODA ASH

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Hercules Powder Co., Wilmington 99, Del.
Mathieson Chemical Corp., 60 E. 42nd St., New York 17, N. Y.

SOLDER

Federated Metals Div.,
American Smelting and Refining Co., 120 Broadway, New York 5.

SPACE HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

SPECIAL FOUNDRY ALLOYS

Vanadium Corp. of America, 420 Lexington Ave., New York, N. Y.

SPRAY GUNS

Murphy & Co., Jas. A., Hamilton, O.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.

SPRUE CUTTERS

Adams Co., Dubuque, Iowa
Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio
Milwaukee Chaplet & Mfg. Co., 1023 S. 40th St., Milwaukee, Wis.

STEEL (Structural)

Alter Company, 1702 Rockingham Rd., Davenport, Iowa.
American Bridge Co., Pittsburgh 19, Pa.

STRAIGHTENING MACHINES (Malleable Iron)

Hydraulic Press Mfg. Co., Mount Gilead, Ohio

STRIPPING MACHINES

Adams Co., Dubuque, Iowa
Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Davenport Machine & Foundry Co., Davenport, Iowa
International Molding Machine Co., LaGrange Park, Ill.
Milwaukee Foundry Equipment Co., 3228 W. Pierce St., Milwaukee, Wis.

SURFACE TREATMENT METALS

Pangborn Corp., Hagerstown, Md.
N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio

TAPER PINS

Standard Horse Nail Corp., New Brighton, Pa.

TEMPERATURE CONTROLLERS

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Foxboro Company, Foxboro, Mass.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.

TESTING EQUIPMENT

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.

TESTING LABORATORIES

Harry Dietert Co., 9330A Roselawn Ave., Detroit 4, Mich.
National Spectrographic Laboratories Inc., 6300 Euclid Ave., Cleveland, Ohio

TESTING MACHINES (Tensile)

Detroit Testing Machine Co., 19390 Grinnell Ave., Detroit 13, Mich.
Steel City Testing Machines Inc., 8843 Livernois Ave., Detroit 4, Mich.

THERMOCOUPLES

Brown Instrument Co. Div. Minneapolis-Honeywell Regulator Co., 4462 Wayne Ave., Philadelphia 44, Pa.
Marshall Co., L. H., 270 W. Lane Columbus 1, O.
Pyrometer Instrument Co., Bergenfield, N. J.
Tamms Silica Co., 228 N. LaSalle St., Chicago 1, Ill.

—When writing advertisers, please mention THE FOUNDRY—

TIERING MACHINES (Power)

Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.

TIMERS (Electric)

Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.

TIN

Federated Metals Div., American Smelting and Refining Co., 120 Broadway, New York 5, N.Y.

TONGS

Industrial Equipment Co., Minster, O.

TOOLS (Electric Portable)

Skilsaw, Inc., 5000 N. Elston, Chicago 30, Ill.

TOOLS (Pneumatic Portable)

Chicago Pneumatic Tool Co., 6 East 44th St., New York 17, N. Y.
Dayton Pneumatic Tool Co., Dayton 1, O.
Gardner-Denver Co., Quincy, Ill.
Independent Pneumatic Tool Co., Aurora, Ill.
Ingersoll-Rand Co., 11 Broadway, New York 4, N. Y.
Joy Mfg. Co., Sullivan Division, Michigan City, Ind.
Schramm Inc., West Chester, Pa.

TORCHES and BURNERS (Acetylene, gas, oil)

Linde Air Products Co., 30 E. 42nd St., New York 17.

TOTE BOXES (see "BOXES-TOTE")

TRACTOR (Gas Powered)

Butler Bin Co., Waukesha, Wis.
Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.
Frank G. Hough Co., Libertyville, Ill.

TRADE ASSOCIATIONS

Crucible Manufacturers Association, 90 West St., New York 6, N.Y.

TRAMRAIL SYSTEMS

American MonoRail Co. 13104 Athens Ave., Cleveland 7, Ohio.
Cleveland Tramrail Div. of Cleveland Crane & Engineering Co., 1155 East 283rd St., Wickliffe, O.
Link Belt Co., 300 W. Pershing Rd., Chicago 9, Ill.
Modern Equipment Co., Port Washington, Wis.

TRAPS

Jas. A. Murphy & Co., Hamilton, Ohio.

TROLLEYS

Curtis Pneumatic Machinery Co., 1922 Kienlen Ave., St. Louis 20, Mo.
Modern Equipment Co., Port Washington, Wis.

TRUCK CRANES

Hughes-Keenan Co., Mansfield, Ohio.
Silent Hoist & Crane Co., 885 63rd St., Brooklyn 20, N. Y.

TRUCK WHEELS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Casting)

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

TRUCKS (Core Oven)

Foundry Equipment Co., 1831 Columbus Rd., Cleveland 13, Ohio.

TRUCKS (Power Lift)

Butler Bin Co., Waukesha, Wis.
Clark Industrial Truck Div. of Clark Equipment Co., Battle Creek, Mich.
Frank G. Hough Co., Libertyville, Ill.

TUBES (Annealing)

Pressed Steel Co. Wilkes-Barre, Pa.

TUBES (X-Ray)

General Electric X-Ray Corp., 4855 Electric Ave., Malwaukee 14, Wis.

TUMBLING BARRELS

N. Ransohoff, Inc., 16 E. 72nd St., Cincinnati 16, Ohio.
Sly Mfg. Co., W. W., 4753 Train Ave., Cleveland 2, O.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

TURNTABLES

Beardsley & Piper Co., The, 2424 No. Cicero, Chicago 39, Ill.
Modern Equipment Co., Port Washington, Wis.
Newaygo Engineering Co., Newaygo, Mich.
Whiting Corporation, 15607 Lathrop Ave., Harvey, Ill.

UNIT HEATERS

Dravo Corp., Neville Island, Pittsburgh 25, Pa.

VALVES (Air, Water, Steam)

Air-Way Pump & Equipment Co., 1050 N. Kilbourn, Chicago, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

VALVES (Blow-off and Cut-off)

Champion Foundry & Machine Co., 1553 West Madison St., Chicago 7, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
C. B. Hunt & Sons Inc., Salem, Ohio
Wm. H. Nichols Co., Richmond Mill, Long Island 18, N. Y.

VALVES (Cupola Pressure)

Norwalk Valve Co., S. Norwalk, Conn.

VALVES (Oxygen, Acetylene)

Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

VENTILATORS (Roof)

Swartwout Co., 18511 Euclid Ave., Cleveland 15, Ohio.

VENTILATING SYSTEMS

American Wheelabrator & Equipment Co., Mishawaka, Ind.
Joy Mfg. Co., La-Del Division, New Philadelphia, Ohio.
Pangborn Corp., Hagerstown, Md.
Propellair Inc., Springfield, Ohio.
Ross Engineering Corp., J. O., 350 Madison Ave., New York 17, N.Y.
Schneible Co., Claude B., 2827—25th St., Detroit 16, Mich.

VENTILATING SYSTEMS (Cont'd.)

W. W. Sly Mfg. Co., 4753 Train Ave., Cleveland 2, Ohio.
Westinghouse Electric Corp., B. F. Sturtevant Div., 40 Wall St., New York 4, N. Y.

VENTS (Core Box)

Champion Foundry & Machine Co., 1314 W. 21st St., Chicago 8, Ill.
Demmler & Bros., Wm., Kewanee, Ill.
C. M. Smillie & Co., 1100 Woodward Hgts. Blvd., Ferndale, Mich.

VIBRATION REDUCTION PADS

Fabreeka Products, Inc., 222B Summer St., Boston, Mass.

VIBRATORS

Adams Co., Dubuque, Iowa.
Beardsley & Piper Co., 2424 No. Cicero, Chicago 39, Ill.
Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.
Davenport Machine & Foundry Co., Davenport, Iowa.
Federal Foundry Supply Co., 4600 E. 71st St., Cleveland 5, O.
Foundry Service Co., Birmingham, Ala.
Foundry Supplies & Mfg. Co., 2221 Orchard St., Chicago 14, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O
Herman Pneumatic Machine Co., Union Bank Bldg., Pittsburgh 22, Pa.
Link Belt Co., 300 W. Pershing Rd., Chicago, Ill.
Martin Engineering Co., Kewanee, Ill.
Milwaukee Foundry Equipment Co. 3238 W. Pierce St., Milwaukee, Wis.
New Haven Vibrator Co., 131 Chestnut St., New Haven 7, Conn.
Nichols Co., Wm., H., Richmond Hill, Long Island 18, N. Y.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.
S P O Incorporated, 7500 Grand Division Ave., Cleveland 5, O.
Frederic B. Stevens, Inc., 18th St. & Vernor Highway, Detroit 16, Mich.
Syntron Company, Homer City, Pa.
Tabor Mfg. Co., 6225 Tacony St., Philadelphia 35, Pa.

VIBRATORS (Core Bench)

Cleveland Vibrator Co., 2828 Clinton Ave., W., Cleveland 13, Ohio.

VISES (Air Operated)

Van Products Co., Erie, Pa.

WASH ROOM EQUIPMENT

Bradley Washfountain Co., Box 732, Milwaukee 1, Wis.

WAX (Core, Vent, Pattern)

United Compound Co., Inc., 328 South Park Ave., Buffalo 4, N. Y.

WEDGES (Foundry)

Chicago Mfg. & Distributing Co., 1928 W. 46th St., Chicago 9, Ill.
Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WELDING GAS

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING APPARATUS (Electric Arc)

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Harnischfeger Corp., 4411 W. National Ave., Milwaukee 14, Wis.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING and CUTTING APPARATUS and SUPPLIES

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WELDING ELECTRODES (Carbon)

National Carbon Co., Carbon Products Div., 30 E. 42nd St., New York 17, N. Y.

WELDING RODS & ELECTRODES

Air Reduction Sales Co., 60 East 42nd St., New York 17, N. Y.
International Nickel Co., Inc., 67 Wall St., New York 5, N. Y.
Linde Air Products Co., 30 E. 42nd St., New York 17, N. Y.

WHEELBARROWS

Sterling Wheelbarrow Co., 7100 W. Walker St., Milwaukee 14, Wis.

WHEELS, ABRASIVE (Cut-off)

Bay State Abrasive Products Co., Westboro, Mass.
Carborundum Co., Perth Amboy, N. J.
Electro Refractories & Alloys Corp., Vars Bldg., Buffalo 2, N. Y.
Independent Pneumatic Tool Co., Aurora, Ill.
Norton Company, Worcester 6, Mass.
Peninsular Grinding Wheel Co., 729 Meldrum Ave., Detroit, Mich.
Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J.
Simonds Abrasive Co., Tacony & Fraley Sts., Philadelphia 37, Pa.
Sterling Grinding Wheel Division, Cleveland Quarries Co., Tiffin, Ohio.

WHEELS (Wire)

Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE BENDERS

Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE BRUSHES

Independent Pneumatic Tool Co., Aurora, Ill.
Osborn Mfg. Co., 5401 Hamilton Ave., Cleveland 14, Ohio.

WIRE CUTTERS

Federal Foundry Supply Co., 4600 East 71st St., Cleveland 5, Ohio.
Redford Iron & Equipment Co., 20733 Glendale Ave., Detroit 23, Mich.

WIRE NAILS

Republic Steel Corp., 3100 E. 45th St., Cleveland 4, Ohio.

WOODWORKING MACHINERY

DoAll Company, Des Plaines, Ill.
Freeman Supply Co., 1152 Broadway, Toledo 5, O.
Oliver Machinery Co., Grand Rapids 2, Mich.

X-RAY EQUIPMENT

Allis-Chalmers Mfg. Co., Milwaukee 1, Wis.
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

X-RAY FILMS

Eastman Kodak Co., Rochester, N. Y
General Electric X-Ray Corp., 4855 Electric Ave., Milwaukee 14, Wis.

ZINC

Federated Metals Div. American Smelting and Refining Co., 120 Broadway, New York 5, N. Y.

—When writing advertisers, please mention THE FOUNDRY—

Classified Advertising

Help Wanted

FOREMAN

Small brass and aluminum foundry, located in New York state. Must be able to produce first class castings at a reasonable cost—know mixtures to produce best results and able to cooperate with others in our organization. Prefer man who has had jobbing experience—married—35 to 45 years of age and who can get results. Address: Box 527, The FOUNDRY, Cleveland 13, Ohio.

CONTACT SALES ENGINEER

Preferably 30-40 years old, college graduate, to contact foundry superintendents and purchasing agents, an overall technical factory representative with metallurgical experience. An exceptional opportunity with an old time company, leader in its field. State experience, references and salary received now. Address: Box 568, The FOUNDRY, Cleveland 13, Ohio.

MOLDING FOREMAN

For small well equipped machine production grey iron foundry, 100 miles Southeast of Chicago. Should have complete cupola, sand and low scrap control experience. State starting salary desired. Address: Box 562, The FOUNDRY, Cleveland 13, Ohio.

SALES METALLURGIST

An attractive metallurgical sales development position is available in Detroit for a graduate metallurgical engineer who is 30 to 36 years old and who has had experience in the production of cast iron. Address: Box 577, The FOUNDRY, Cleveland 13, Ohio.

SALES EXECUTIVE WANTED

Excellent opportunity with well established production jobbing foundry producing malleable castings, gray iron castings, zinc die castings and steel forgings. Applicant must have engineering training and general knowledge of foundry practice. References required. Address: Box 579, The FOUNDRY, Cleveland 13, Ohio.

Manufacturer's Agents

MANUFACTURER'S AGENT

Qualified men to introduce our "Proto" Plow, a revolutionary device used in foundries where overhead sand distribution systems exist. High commission. Address: FACTORY SPECIALTY CORPORATION, 3418 McDOUGALL, DETROIT 7, MICH.

MANUFACTURERS' AGENTS

Sales representatives to sell core oils in Michigan and Alabama. Address: Box 556, The FOUNDRY, Cleveland 13, Ohio.

MANUFACTURER

Chilled shot and grit wants one sales organization to cover entire domestic markets. Can work out very profitable arrangement. Address: Box 575, The FOUNDRY, Cleveland 13, Ohio.

MANUFACTURER'S AGENTS

Apex Core Oil sales distributors with proven sales record to the foundries. Open territories in Milwaukee, St. Louis, Toledo and Birmingham areas. Excellent opportunities.

APEX MOTOR FUEL COMPANY
INDUSTRIAL DIVISION
1401 W. NORTH AVENUE
CHICAGO 22, ILLINOIS

REPRESENTATIVES WANTED

Manufacturer of electronic core baking equipment desires representation on commission basis in several open territories. Must be established and now representing other foundry equipment manufacturers. Exclusive territories will be granted. Address: Box 555, The FOUNDRY, Cleveland 13, Ohio.

Manufacturer's Agents

SALES REPRESENTATIVE

Reliable representative wanted for the sale of dry core binder in the following areas: Chicago, Ill.; Buffalo, N. Y.; Indianapolis, Ind. Men with foundry experience, established and allied lines preferred. Address: Box 563, The FOUNDRY, Cleveland 13, Ohio.

Pattern Work Wanted

Modern pattern shop, Cleveland area. Can take wood and metal first class work. Let us quote from your prints. Address: Box 516, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY ENGINEER

Graduate metallurgist with experience as Superintendent, Plant Manager and Sales Manager desires permanent position. Experienced in gray iron foundries with cupola operations, molding methods, sand conditioning and sand handling in both jobbing and production foundries. Have had the same experience in electrical steel foundries producing alloy and plain carbon steels. Familiar with heading, gating and rigging of patterns and also the making of patterns. Age 36. Willing to move anywhere in the United States. Address: Box 519, The FOUNDRY, Cleveland 13, Ohio.

SALES EXECUTIVE

Foundry sales executive, experienced in promoting the sale of gray iron and alloy castings in buyers' market, desires opportunity to associate himself with progressive organization. Has successful record in both sales and general administrative capacities. Has had broad experience in dealing with automotive industry, also in dealing with manufacturers of household appliances and general industrial equipment. Complete details of business record upon request.

BOX 558
THE FOUNDRY CLEVELAND 13, OHIO

SUPERINTENDENT
GENERAL FOREMAN

Twenty-five years' practical experience—15 years as molder and 10 years as foreman and superintendent of both jobbing and high productive shops. Well versed in all departments including cupola, mixing metal, rigging and gating for fast production and best quality castings. Cost minded and can handle men. Address: Box 574, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY CONSULTANT

Practical gray iron foundryman, broad experience specializing in production of high grade medium and heavy castings by modern, controlled methods offers short term services only in advisory capacity or as consultant. Improve quality, reduce scrap, modernize methods and increase profits. Address: MR. SAMUEL APPELBY, 74 LAMARCK DRIVE, BUFFALO 21, NEW YORK.

FOUNDRY SUPERINTENDENT
OR
MANAGER

Forty years' experience in mechanized foundries in automotive work, farm implement and fittings. Have managed foundries producing 850 tons of grey iron per 16 hour day and familiar with all phases of foundry production. Practical experience. Address: Box 564, The FOUNDRY, Cleveland 13, Ohio.

SALES MANAGER

Foundry equipment and supplies, technically and practically trained with 23 years' sales experience in Europe and U.S.A., desires connection with progressive firm interested in export to Europe. Managed one of the largest firms in that line in Central Europe. Full knowledge of European Market. Past member of AFA, So. Calif. A-1 references. Address Box 569, The FOUNDRY, Cleveland 13, Ohio.

Positions Wanted

FOUNDRY METALLURGIST

B. S. degree in metallurgical engineering. Experienced in producing steel in the three phase, direct arc, electric furnace, also familiar with melting grey iron in either the electric furnace or the cupola. Possess a good knowledge of laboratory procedures, sand testing and radiography work. Will make every effort to lower scrap losses and costs. Address: Box 465, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Twenty-two years in machine tool foundries and others requiring cast iron of similar high quality. Superintendent and assistant for five years. Age 39. Now employed. Address: Box 442, The FOUNDRY, Cleveland 13, Ohio.

PATTERNSHOP

Why not have your patternshop pay its own costs and show a profit. Fast and experienced wood and metal patternmaker, foreman of larger shop or working foreman in small shop. Capable of estimating work layout from drawing to making patterns small or large and checking patterns and castings. Foundry experience in pattern mountings, gates and core box driers. Can teach apprentices fastest methods enabling rapid advancement. Address: Box 473, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY FOREMAN
OR
MELTING SUPERVISOR

Practical experience with technical training making castings from fraction of an ounce to a ton on production and jobbing work in grey iron. Experienced in cost analysis of foundry methods and materials. Desires to make a change to a progressive foundry with opportunities for advancement. Location Middle or Southeastern States. Address: Box 561, The FOUNDRY, Cleveland 13, Ohio.

ALUMINUM PERMANENT MOLD DESIGNER

WILL DESIGN, ESTIMATE COSTS AND PRODUCTION. TWENTY-FIVE YEARS' EXPERIENCE. PART TIME WORK BY HOUR OR CONTRACT. ADDRESS: BOX 501, THE FOUNDRY, CLEVELAND 13, OHIO.

PATTERNMAKER

First class mechanic, also trouble shooter in foundry. Thirty years' experience in patterns, wood and metal and foundry work. Address: Box 515, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY METALLURGIST

Specialize in technical control of irons and sands. Knows cupola operation, melting practices and foundry sands. Foreman and supervision experience. 27 years old, college graduate, five years' experience. Excellent recommendations as to ability and character. Desire responsible permanent position with future. Production and cost conscious. Address: Box 554, The FOUNDRY, Cleveland 13, Ohio.

METALLURGIST

Fifteen years' experience involving cupolas and electric furnaces. Any kind of iron made to close specifications. Versed in chemical and physical testing and sand control. Best references. Address: Box 557, The FOUNDRY, Cleveland 13, Ohio.

FOUNDRY SUPERINTENDENT

Age 37, experienced in production and jobbing machine tool, pump, engine and miscellaneous castings. Familiar with process iron and modern alloying technique. Good sand control, excellent labor relations. Some experience with nonferrous alloys. My scrap past two years has been 2.2%. Address: Box 552, The FOUNDRY, Cleveland 13, Ohio.

WORKS MANAGER

Manager of industrial relations. Thoroughly familiar with all production processes in manufacture of carbon, medium and high alloy castings. Have successfully supervised purchasing, stores, production control, production engineering, plant engineering, metallurgy, inspection, time study and incentive plans, cost estimating, cost accounting, labor relations and contract negotiations with unions. University graduate. Address: Box 534, The FOUNDRY, Cleveland 13, Ohio.

Classified Advertising

Positions Wanted

NONFERROUS FOUNDRY MANAGER OR SUPERINTENDENT

ALUMINUM AND BRASS FOUNDRYMAN, AGE 46, NOW IN FULL CHARGE OF A MEDIUM SIZE NONFERROUS FOUNDRY IN THE MIDWEST WOULD LIKE TO MAKE A CHANGE. 26 YEARS' PRACTICAL EXPERIENCE IN ALL PHASES OF BRASS AND ALUMINUM FOUNDRY OPERATION INCLUDING GATING, RIGGING, COST CONTROL AND ESTIMATING FROM BLUE PRINTS. ANY LOCATION BUT PREFER WEST COAST. ADDRESS: BOX 542, THE FOUNDRY, CLEVELAND 13, OHIO.

MANAGER—SUPERINTENDENT

Experienced grey iron jobbing production, soil pipe and fittings, steam and drainage. McClain graduate mixing and melting. Produce machinable iron without pig. Well versed all operations. Desire position Eastern states. Address: Box 503, The FOUNDRY, Cleveland 13, Ohio.

SUPERINTENDENT OR GENERAL FOREMAN

Forty years' practical experience, light, medium and heavy work, production or jobbing. Plenty of machine experience including sand slinger. Am a man of proven ability. Salary to be left open until I show you. Address: Box 547, The FOUNDRY, Cleveland 13, Ohio.

CONSULTANT

Consultant in foundry operations—gray iron, malleable iron and steel. Address: Mr. Herbert F. Miller, 1808 Hancock St., Rockford, Illinois.

FOUNDRY SUPERINTENDENT

Twenty-eight years' experience as foundry superintendent. Practical molder. Understand cupola thoroughly. Prefer position with foundry making high grade castings. At present employed. Address: Box 571, The FOUNDRY, Cleveland 13, Ohio.

GRAY IRON FOUNDRYMAN

Practical foundryman with technical training. Thirty-two years' experience, including fifteen years of supervision. Well versed in all phases of jobbing and production work on light and medium castings. Progressive and up-to-date in modern methods. Capable of taking complete charge of medium size foundry. Available on short notice. Address: Box 570, The FOUNDRY, Cleveland 13, Ohio.

METALLURGICAL ENGINEER

Fifteen years' experience in iron and steel castings, rolls, manganese, Alnico and other special alloy castings. Foundry management, quality control, specifications. Qualified metallurgist, superintend foundry, head research, technical sales, technically assist executive. Address: Box 567, The FOUNDRY, Cleveland 13, Ohio.

Open Capacity

BRASS CASTINGS

Completely modern production foundry and machine shop has open capacity for light and medium brass castings. Can make excellent price on quantity runs. Address: Box 530, The FOUNDRY, Cleveland 13, Ohio.

AVAILABLE CAPACITY

Our foundry has open capacity to supply small and medium size gray iron castings. Send sample. Address: OREGON CASTINGS CO., RD 3, Lititz, Pa.

OPEN CAPACITY

We have open capacity for gray iron castings on cope and drag, squeezer and floor molding. Inquiries appreciated. Address: THE TREATY COMPANY, GREENVILLE, OHIO.

Foundries For Sale

LIQUIDATION SALE
FOUNDRY AND EQUIPMENT

Twenty-five miles from Boston toward Cape Cod appr. 3 acres of land with 2 railroad sidings. Main foundry building of metal and brick construction is 310 ft. long, 90 ft. wide and 45 ft. high also side buildings, sheds and separate office building. Melt cap. is 20 to 40 tons daily.

Included in sale is dismantled sand handling system in fine condition consisting of 20 moulders' hoppers, two 25 ton sand storage bins, one #50 Beardsley & Piper Speed mullor with 40 HP motor, magnetic separator with bucket elevator, overhead monorail system and cab controlled electric hoist and monotractor and shell buckets with automatic trips for delivering sand from speed mullor to moulders' hoppers.

Other equipment includes 2 American Wheelabrators 36 x 42, 80 moulding machines of various types, sand mullers, American Tablast, 3 coreblowers, 2 Whiting #6 cupolas and 1 #7 cupola, Screenarators, grinding machines, hoists etc.

List of equipment will be mailed on request.

All items are offered subject to prior sales.

OLD COLONY FOUNDRY CO.
EAST BRIDGEWATER, MASSACHUSETTS

FOR SALE

BRASS & ALUMINUM FOUNDRY

In operation—completely equipped—immediately available in Ohio area. Old established firm, good accounts, capacity 8 tons daily, experienced labor. Owners desirous of disposing to liquidate estate.

BOX 559

THE FOUNDRY CLEVELAND 13, OHIO

THIRTY YEARS

In the same location. This pattern shop is well-equipped and ideally located in a low rental business district of Boston. A gem of an opportunity for one or two good men. Will turn over with work on hand. Price $7500 complete for immediate action. Owner unable to devote full time to operation.

BOX 565
THE FOUNDRY CLEVELAND 13, OHIO

FOUNDRY FOR SALE

Very profitable pouring 4 to 5 tons per day. Northern Pennsylvania. Only industry in town. $35,000 total price. Address: Box 446, The FOUNDRY, Cleveland 13, Ohio.

SMALL GRAY IRON FOUNDRY

Fifteen molders—22,000 sq. ft. Good building—steel and brick—all equipment for full operation. Exceptional bargain. Location, Ironton, Ohio. Address: Box 520, The FOUNDRY, Cleveland 13, Ohio.

Employment Service

SALARIED POSITIONS
$3,500—$35,000

If you are considering a new connection communicate with the undersigned. We offer the original personal employment service (39 years recognized standing and reputation). The procedure, of highest ethical standards, is individualized to your personal requirements and develops overtures without initiative on your part. Your identity covered and present position protected. Send only name and address for details.

R. W. BIXBY, INC.
101 DUN BLDG. BUFFALO 2, N. Y.

Foundries For Sale

Employment Service

EMPLOYERS
ESTABLISHED 1922

Specializing in thorough screening of qualified personnel for any phase of operations in gray iron, steel, malleable, all non-ferrous and permanent mold foundries.

APPLICANTS:

If you can furnish QUALIFIED references, attesting to your CAPABILITY and DEPENDABILITY, your application will be accepted and we will secure for you the desired position.

IMMEDIATE OPENINGS
(Partial Listing)

MANAGERS
SUPERINTENDENTS
ASS'T. SUPTS.
GENERAL FOREMEN
CORE ROOM FOREMEN
MOLDER FOREMEN
CLEANING ROOM FOREMEN
CUPOLA SUPERVISORS
SR. INDUSTRIAL ENGINEERS
JR. INDUSTRIAL ENGINEERS
TIME STUDY ENGINEERS
PATTERN DESIGNERS
PERM. MOLD DESIGNERS
PERM. MOLD FOREMEN
PATTERN FOREMEN
MASTER MECHANICS
PLANT ENGINEERS
MAINTENANCE SUP'TS.
MAINTENANCE FOREMEN
LABOR FOREMEN
METALLURGISTS
CHEMICAL ENGINEERS
CHEMISTS
PRODUCTION CONTROL
SALES ENGINEERS
ACCOUNTANTS

If you are experienced in any phase of foundry operations—and desire to improve your future working conditions:

WRITE

EMPLOYERS SERVICE BUREAU
6 NORTH MICHIGAN AVE., SUITE 708
CHICAGO 2, ILLINOIS
TELEPHONE: FInancial 6-1155

SALARIED PERSONNEL

$3,000—$25,000. This reliable service, established 1927, conducts confidential negotiations for high-grade men who seek a change of connection under conditions assuring, if employed, full protection to present position. Send name and address only for details. Personal consultation invited. Address: JIRA THAYER JENNINGS, 241 ORANGE STREET, NEW HAVEN 10, CONN.

Classified Advertising

For Lease

FOR LEASE
GOVERNMENT OWNED FOUNDRIES

Sealed bids will be received at the Office of the District Engineer, Louisville District, Corps of Engineers, U. S. Army, 830 W. Broadway, Louisville, Kentucky, until 11:00 AM, CST, 14 July 1949, and then publicly opened for the leasing of Air Force Plant No. 36 (a portion of former Wright Aeronautical Plant), consisting of approximately 67 acres of land, 2 Aluminum and 1 Magnesium Foundry Buildings, 1 Frame Storage Building and Parking Area, located at Lockland, Ohio, approximately 12 miles from downtown Cincinnati, Ohio. Foundry buildings were constructed in 1942 of steel framing, tile exterior walls, concrete floors. Each foundry complete with equipment for production of castings, with RR siding, ample storage space, cafeteria, showers, locker rooms and toilet facilities. Lease will be for a term of five years with option to extend for two consecutive five year periods. Bids are solicited for entire installation but may be submitted for individual buildings. Detailed information, arrangements for inspection and bid forms may be obtained from the office of the

DISTRICT ENGINEER,
REAL ESTATE DIVISION
P.O. BOX 59, 830 W. BROADWAY
LOUISVILLE, KENTUCKY
WABASH 7571

Wanted-To-Buy

WANTED

One used electric furnace of approx. ten (10) tons capacity and of modern design.

PURCHASING DEPARTMENT
NEWPORT NEWS SHIPBUILDING
AND DRY DOCK CO.
NEWPORT NEWS, VA.

INDUCTION FURNACES WANTED

100 Kw. 3000 cycle Motor Generator Set

Furnaces 200-500 lbs. capacity

Complete with control Equipment

BOX 560

THE FOUNDRY CLEVELAND 13, OHIO

WANTED
PIPE FITTING PATTERNS

We are going into the pipe fitting casting business and are interested in buying pipe fitting patterns of any type or kind. Address: Box 488, The FOUNDRY, Cleveland 13, Ohio.

WANTED

1—Used No. 601 jolt rollover pattern draw molding machine. Address: ST. JEROME INDUSTRIES LTD., ST. JEROME, CO. TERREBONNE, PROV. QUEBEC, CANADA.

WANTED

12,000 lb. pouring ladle. Would be willing to exchange for 2 tumbling barrels with motors, one 12' long x 48" dia. and one 6' long x 36". Address: THUNDER BAY MFG. CORP., ALPENA, MICHIGAN. PHONE 834.

For Lease

Wanted-To-Buy

PATTERNSHOP

Interested in buying patternshop or part interest. Experienced patternmaker in wood and metal, matchplate and precision casting. Can make shop pay profit. Address: Box 472, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Late model electric furnace. Champion speed draw stripping machine. Address: ILLINOIS FOUNDRY COMPANY, SPRINGFIELD, ILL.

WANTED

1—16 x 36 type RCS rotary positive type—Roots-Connersville blower or equivalent for cupola operation. Address: DAYTON STEEL FOUNDRY CO., P. O. BOX 1022, DAYTON 1, OHIO.

MIXERS WANTED

Used Simpson Intensive Sand Mixers. State size, condition and lowest cash price for immediate acceptance. Address Box 578, The FOUNDRY, Cleveland 13, Ohio.

WANTED

Sand blasting unit for drums, two or three wheels, nineteen inches or larger diameter, Wheelabrator preferred. Give price, description and condition. Address: INDUSTRIAL STEEL CONTAINER COMPANY, ST. PAUL 1, MINNESOTA.

WANTED

64" or larger American
WHEELABRATOR
Both table and tumbling
type of interest

BOX 566

THE FOUNDRY CLEVELAND 13, OHIO

Opportunities

OPPORTUNITY

We have a foundry and machine shop equipped for smaller type work in quantities. We are looking for a small or medium type machine to manufacture, engineer and sell. Address: Box 551, The FOUNDRY, Cleveland 13, Ohio.

Opportunities

OPPORTUNITY

We can furnish at any point slack, fibre and tight barrels; also fibre and steel drums. Address: BUCKEYE COOPERAGE COMPANY, 3807 ORANGE AVENUE, CLEVELAND 15, OHIO.

OPPORTUNITY

Complete pattern equipment for malleable pipe fittings, sizes ⅜" to 2". For sale or will cooperate with a foundry to produce. Address: LAKESIDE FOUNDRY, WARSAW, INDIANA.

For Sale

SURPLUS EQUIPMENT

Climax 2½ core wire straightener
Practically new $225 or best offer

WM. R. SHIELDS CO.
GENERAL MOTORS BLDG.
DETROIT 2, MICH.
MA 0090

EQUIPMENT FOR SALE

MOLDING MACHINES
3—75J Osborn Jolt Squeeze.
2—SPO #611-B Stationary, Oscillating, Jolt, Squeeze Strippers
1—SPO #4½ JHS Air Jolt Hand Strip
3—Mumford 3" Cyl. Core Jolt, with 20" x 15" Table
4—Osborn #36 core box drawing machines.

BLOWERS FOR CUPOLAS AND FURNACES
2—Spencer Turbine Cupola blowers 4100 CFM 16-oz, 25 HP direct connected motor
Maxon-Premix Blowers for Gas, ¼ to 1 H.P.

METAL MELTING EQUIPMENT
1—Hausfeld 2000# Aluminum Capacity Furnaces. Barrel Type, Open Flame, Oil Fired
2—Monarch-Rockwell Rotating, 500# Brass, Oil New 32" to 41" Dia. Shell Cupolas made to order.
1—Buckeye #150 crucible filling furnace, with premix blower for gas fire

TUMBLING MILLS AND SAND BLAST
1—Pangborn style GJ-1 rotoblast barrel, complete with Pangborn style FM automatic loader. Load capacity approximately 16 cu ft.
1—Pangborn No. 2 GH direct pressure type sandblast barrels, motor driven. Complete units.
1—Pangborn LE 6 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn LE 4 ft. sandblast table, continuous sand feed, motor driven. Complete unit.
1—Pangborn Sand Blast Unit including generating tank, shot cleaner, bucket elevator. Suitable for use with room.
1—Pangborn type EN-2 sand blast cabinet, suction type, 5 x 3 x 7 high.

MISCELLANEOUS
2—Ingersoll-Rand size LC-7 Air Hoists, 700# capacity.
1—Gardner-Denver air compressor complete with 5 HP 3/60/220 motor and controls.
4—Heavy duty flexible shaft grinders 2 HP.
1—Heavy Duty Back Geared Sprue Cutter, 1½" square knives, T & L Pulley Drive.
1—Fay & Egan 14" blade revolving, double arbor, tilting table, variety saw with roller table.
1—Young Bros. Co. tower core oven, 5' x 1' shelves, gas fired, complete with Foxboro Control.
1—Young Bros. Co. batch type recirculating hot air gas fired core oven, 5' x 6' door opening, 9' deep.
3—Foundry Equipment Co. sliding shelf core ovens with five 30 x 42" shelves, 8" high. Gas Fired.
1—Lampson Endless Mold Conveyor 100' long x 16' wide, with 19 x 26" pallets, 36 inches on centers.
2—Warner material elevators 1000# capacity, 20' lift, 2' x 2' two tier cab.

CLIFTON MACHINERY CO.
1023 W. 6th ST. CINCINNATI 3, OHIO
PHONE PARKWAY 7812

Classified Advertising

For Sale

FOR SALE
FURNACES

At small, small fraction of cost
all in original set-up

Mahr Car Type 6' x 12' Annealing; Gas Machinery 8' x 13' x 6' Car Type Oil Fired; Furnace Charging Cars (3) 38" Gauge; Oil Fired 8' x 13' Car Type Combination Annealing & Draw; Buzzer #64 Hi Speed

Many Other Items

Come & inspect—Real Low Prices.

FOUNDRY EQUIPMENT

All set up as last used
Amazingly low prices

Cooling Tower; Whiting #5 Cupola; Coleman Car Type core Oven; Blodget Cabinet Core Oven; Osborne Roll Over Molder; Kane & Roach Shear; Osborne Molders #405-1 Jolt Rollover also Stripper Pin Cape; Buffalo Air Washers; Southwark 500-Ton Hydraulic Press; Spencer Portable Vacuum Cleaner; Pangborn Twin Blast Room; Pangborn Rotoblast Barrel; and others

COME QUICKLY—INSPECT—BUY

ROCHESTER INDUSTRIAL TERMINAL CORPORATION
WEST AVENUE—ROCHESTER, N. Y.
PHONE: GENESSEE 0102

FOR SALE

1—Osborn #2042 Rollover, Stationary	$300.00
1—International Draw Down Stripper 30" x 72"	750.00
3—Osborn Rollover jolting Molding Machines 2047-1, 10" draw, Flasks 22½" x 22½"	750.00 ea.
4—Tabor Cantilever Type Jolt Squeezes, Portable	200.00 ea
1—Fisher Type S New, capacity 400 alum. Ser. No. 2698 4 burner Gas Fired Stationary Melting Furnace, complete with assembly valves, sliding cover assembly, No Blower	400.00
1—Oil Fired Core Oven 60x60x72" deep & Thermostat	450.00
3—Globe Side Tilting Barrels, without motors	175.00 ea.
1—Screenerator Type M	350.00
1—Jeffrey Sanditioner, Ser. No. 4764-0 133523 with Allis Chalmers 2 H.P. motor 3/60/440 reconditioned	550.00
125—No. 150 Dixon Crucibles with 4" attached lip	15.00 ea.
1800—Ft. 26" Roller Conveyor	
2000—Ft. 15" Roller Conveyor	
12—Spencer turbo blowers 2 H.P. to 10 H.P.—half price for quick sale	
Transite Core Plates	
Aluminum Slip Flasks	
Cast Iron Jackets	
We also carry in stock	
BLOWERS ALL TYPES	
1000 MOTORS ALL TYPES	
CRANES & ELECTRIC HOISTS	
DOUBLE END GRINDERS	
STEEL TANKS.	

UNIVERSAL MACHINERY & EQUIPMENT CO.
320 E. BROAD ST.
SHILLINGTON, READING, PA.

FOR SALE

1—American Foundry Equipment sand cutter 72", gas powered, type K, serial 1017, 38 HP Buda motor, silent chain drive, hand start, condition fair.

1—American Foundry Equipment sand cutter 72", gas powered type K, serial 1031, 60 HP Buda motor with twin disc clutch and V belt drive and starter, condition good.

ALBION MALLEABLE IRON COMPANY
ALBION, MICHIGAN

FOR SALE

Two (2) side door charge Heroult electric arc furnaces including shell, roof, mast, winch motor assembly, electrode assembly, tilting mechanism, tilt control panel stand, one GE furnace control panel, one set flexible secondary leads. No transformers.

One (1) Ajax 50 pound induction furnace, complete with control panel and required capacitors. No motor-generator nor bus bars are included. In excellent condition.

BOX 416
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

1—Cleveland tramrail monorail crane, cab-controlled, complete with cable and bucket control switch. Capacity 4000 lbs. Serial #45556. Hoist motor 220 volt, 31 amp., 7.5 H.P., 1150 RPM.

1—Hayward motor-operated clamshell bucket, 220 volt, ½ cubic yard capacity. Serial #12566. Originally purchased for use with above crane.

1—Pauling and Harnischfeger manual trip, single line, "Sand" type clamshell bucket, 1 cubic yard capacity. Serial #75447.

1—#2 ½ cupola, rebuilt in March 1948, I.D. windbox 3'9", stack 21½ ft. high in 2 equal sections, I.D. upper 3' 6", I.D. lower 3' 9".

1—#3 Root positive displacement blower. Serial #30144.

ELECTRON CORP.,
FOUNDRY DIVISION
5200 S. SANTA FE
LITTLETON, COLORADO

FOR SALE

2—American Wheelabrators—20 x 27 & 36 x 42
7—Electric 10 ton Northern cranes—1945
Ingersoll Rand air compressor—250 HP
602 Osborn molding machine—1943
30' Coleman tower core oven

WE INVITE YOUR INQUIRIES

BALCHER MACHINERY SALES
1884 S. Compton Road Cleveland Height 18, Ohio
Telephone FAirmount 1186

For Sale

Dismantling Westland Steel Foundry

5000 Lb. Electric Arc Furnace, Automatic Controls, 1000 KVA Packard Transformer.

Model 315 Schramm Air Compressor and Motor.

50 Ft. Span 7½ Ton Crane, A.C. 440 Volts.

Simpson Type Muller, 6 foot Dia. 10 H.P. Motor.

6 Ft. x 6 Ft. x 4 Ft. Gas Fired Core Oven.

26 x 17 x 5 Electric Annealing Furnace with Tapalog Recorder.

Ajax 35 K.W. Salt Hardening Furnace.

Swing Grinder, 7½ H.P. Motor, 2 x 16 Wheels.

Richards Wilcox, 1½ Ton, 27 Ft. Span Traveling Crane.

Various Top and Bottom Pour Ladles and other Foundry Equipment.

RELIANCE FOUNDRY COMPANY LIMITED,

149 WEST FOURTH AVE.,

VANCOUVER, B. C.

FOR SALE

SAND MIXER

Model 920 Clearfield, 9' dia., 20 to 25 Cu. Ft. capacity with No. 3 bucket type loader and electrical equipment Serial No. 193C, new in 1941.

TUMBLERS

7 and 14 Cu. Ft. Pangborn "Rotoblast" barrels each with hopper, dust collector and electrical equipment. New in 1942 and 1943.
Globe and Hartford octagonal barrels.

MOLDING MACHINE

No. 193-4 Milwaukee jolt, squeeze, strip. Serial No. 11794, new in 1942.

FURNACES

No. 690 M Campbell Hausfeld tilting type for brass or aluminum. Gas fired.
4—No. 80, type S, Fisher pit type for brass or aluminum. New about 1941 or 1942.

BLOWERS

Many sizes of pressure blowers and exhausters. Send your inquiry.

MILES MACHINERY CO.
SAGINAW, MICH.

GOOD USED EQUIPMENT

Sly Dust Collecting System, consisting of 3 Sly #62 Dust Filters to handle 15,000 CFM each. Motors 220/440 volt, 3 phase, 60 cycle. Was erected, but not used.

36" x 42" American Wheelabrator Tumblast, with Dust Arrester, 220 volts, 3 phase, 60 cycle.
6-Ton Northern, 46' span, 2 motor, 230 v. Bridge Crane. Rope floor controlled.

2-5-ton Bridge Cranes, 30' span, 3 motor, cab operated, 230 volt DC, equipped with magnet controller and enclosed cab.

2—Chicago Pneumatic Air Compressors, 225 CFM capacity, 100# pressure, 2 stage.

IRA C. JORDAN
2508 EAST BELLEVIEW PLACE
MILWAUKEE 11, WISCONSIN

Classified Advertising

For Sale

COAL PLANT PARTS

PULVERIZER CAPACITY—5 TONS PER HOUR

2—36" drivers (new) L.H.
2—36" tracks (new) L.H.
1—36" track bushing (new)
10—Rollers for 36" driver (new)
1—R.H. single flight screw conveyor, 9'2"
1—R.H. single flight screw conveyor, 6'4"
1—R.H. single flight screw conveyor, 8'0"
2—Shafts for 36" pulverizer (new)
2—8" R.H. double flight screws
2—8" L.H. double flight screws
3—9" R.H. single flight screws
2—Sets—Pillow block pulv. bearings
1—9" R.H. screw conveyor and case (new)
1—Set Goodyear D-210 Steel cable V belts (new)
1—54" P.D. 10 groove sheave (new)

D. C. MOTORS

(None Totally Enclosed)

7—General Electric Type R.C. 9, Shunt Wound D.C. motors, 3 H.P., 475 to 1425 R.P.M., 230 volts, 14.5 Amps Model No. 70119
1—General Electric Model 27A242 D.C. Shunt wound motor, 1 H.P., 500 to 1500 R.P.M., 230 volts, 7.5 Amps
1—Engberg Shunt wound D.C. motor, 1½ H.P., 230 volts, 600 to 1800 R.P.M.
1—General Electric 10 KW Generator, Compound wound, 1800 R.P.M., 150 to 250 volts, Serial No. 1150487

GRINDERS

4—Marschke Economy Grinders, Type AB, 7.5 H.P., 1160 R.P.M.

BAUSCH & LOMB NO. 843 SPECTROGRAPH

1—With accessory parts. Has never been used and is new equipment as received from the manufacturer. Can be purchased at an attractive price.

1 NO. 40 WHITING UNIT PULVERIZER

1—#40 pulverizer, complete
1—125 sq. in. disc type air gate and 1 #3½ W.C. Burner
1—#40 Clarage exhauster, 28½" blades

SANDCUTTERS

1—Type M, 69/50 Serial No. 124
1—Type M, 79/60 Serial No. 145
1—Model K, 6 ft. Serial No. 1055
1—Model K, 72"

A. C. MOTORS

GENERAL ELECTRIC
1—30 H.P. RPM Type KT 382 No. 1410482 Open
1—50 H.P. 900 RPM Type KT342 No. 1771809 Open
1—35 H.P. 900 RPM Type KT352 No. 1413651 Open
1—40 H.P. 680 RPM Type KT No. 1651134 Open
1—25 H.P. 900 RPM Type KT326 No. 3954932 Open

HOWELL
1—7½ H.P. 1730 RPM Type SC28 No. 218260
1—50 H.P. 1800 RPM No. 29295 Open
1—10 H.P. 1800 RPM No. 212891 Open

WESTINGHOUSE
1—30 H.P. 1140 RPM, Type MS, Style No. 778071 Open
1—50 H.P. 1200 RPM, Wound Motor No. 2370339

The facility for which this equipment was purchased is no longer necessary and the equipment has never been used. It can be purchased at an attractive price.

All equipment is available for immediate delivery.

BENTON HARBOR MALLEABLE INDUSTRIES
BENTON HARBOR, MICH. TELEPHONE 6141

NEVER USED—WILL SACRIFICE

One molding machine #559 jolt stripper made by Osborn Mfg. Co. One molding machine #442 jolt rockover pattern draw made by Osborn Mfg. Co.

THE ENTERPRISE MFG. CO. OF PA.
3rd & DAUPHIN STREETS
PHILADELPHIA 33, PA.

FOR SALE

Despatch style S gas fired core drying oven, excellent condition. Width 8 ft., height 8 ft., length 12 ft. Complete with control equipment. For specifications write: UNIVERSAL CASTINGS CORP., 5821 WEST 66th ST., CHICAGO 38, ILL.

FOR SALE

5 SPECIALS

2 Norton Type C Cylinder Grinders, 10 x 18, 15 h.p., 220-440, feed 500-1800.
Cincinnati Hydraulic Cylinder Grinder, 6 x 18, 10 h.p., Model EA '38.
Milwaukee 143-9 Jolt Squeeze Strip Machine, nearly new.
GE Compressor, 100 c.f.m., high pressure, 35 h.p., direct drive.
All excellent condition, priced for quick sale.

JAY SALTER
306 ROSEDALE ST., ROCHESTER 7, N. Y.

FOR SALE

1—American Wheelabrator size 20 x 27 complete with dust collector, spare parts
3—Tons #G 50 shot
1—Gardner-Denver air compressor, complete with 10 H.P. motor
1—Fisher Blower with 10 Horse Motor
2—Time clocks
2—Furnaces with oil burners complete
25—13" x 18" steel flasks
12—12" x 18" steel flasks
Other miscellaneous foundry equipment.

H. G. WILLIAMS
7206 E. Truman Road Kansas City 3, Mo.

FOUNDRY EQUIPMENT

1—Osborne Core Blower, No. 193
1—Demmler Core Blower, Style 3-E
1—Osborne Core Box Drawing Machine #146
Molding Machines—Herman R. O. 1500 lb. cap.
International 24" x 30" Type G
Osborne Jolt Squeezers, various sizes
3—2-ton Ingersoll Air Hoists

RAY P. SCULLY
SCULLY MACHINERY & EQUIPMENT CO., NOT INC.
767 MILWAUKEE AVE. CHICAGO 22, ILL.
PHONE: CANAL 6-0314

FOR SALE

One model 28-A Davenport rollover, table size 28" x 40". Slightly used. Address: JARDINE BRONZE FOUNDRY, 80 E. GENESSEE STREET, BALDWINSVILLE, NEW YORK.

FOR SALE

Core mch., stem type "Wadsworth" w ½ hp mtr.
Core mch., "Demler" #1
Core oven, 2 compt—oil "Maehler" complete
Furnace, melting-rotary hearth-gas "Cont" approx. 18' dia.
Furnace, preheating rotary-hearth-elec. "GE" 175KW 15' dia.
Furnace, heat treat-elec. Lindberg 12' x 6' x 8'h
Furnace, mold drying conv type "Ind. Htg." forced circ.
Furnace, mold heating "Ind. Htg." 8'-7"l x 18"w
Furnace, mold heating conveyor type "Ind. Htg." 6'l x 20"w
Furnace, heat treat "Ind. Htg." complete
(4) Furnaces, preheating-elec. "Haskins" FR252.9
(15) Furnaces, melting-oil "Fisher" size B for #25 cruc.
(8) Furnaces, melting-oil "Simplex" 500# cap.
(4) Furnaces, melting-Bohn design-for cadmium recovery
(2) Furnaces, melting gas "Ind. Htg." pot type
Ingot casting unit, wheel type—Bohn design
Riddle, 20" gyratory "Combs" w 1/6 hp mtr.
Sand mixer, drum type w 10 hp mtr.
Magnetic separator, Dings 24" spec. mod BN
Wheelabrator, tumblast "Amer." 27 x 36" chamber, 5 cu. ft. cap. complete with pit type loader, blower, centre-merge arrestor unit and elevator belt with buckets, less motor.
Blower, "American" #2V w 1 hp mtr.
Blower, "Spencer Turbine" 32 og. 1050 CFM w 15 hp mtr.
Blower, "Amer. Sirocco" #3½ w 5 hp mtr.
Blower, "Buffalo" #3½ duplex conoidal w 2 hp mtr.
Blower, "American" #5 w 5 hp mtr.
Blower, "American" #5 w 5 hp mtr.
Blower, "American" #5 w 5 hp mtr.
Blower, "American" w 7½ hp mtr.
Blower, "Spencer Turbo" #316-B2-1 w 5 hp mtr.
Blower, "American" #5V w 5 hp mtr.
(2) Blowers, "American" #4 with 3 hp mtrs.
Polishing mch., metallographic-floor mod. w ¼ hp mtr.
Pyrometer, Hoskins type PA
Scale, in grams "Ohaus"
Scale, "Jacobs Detectogram" mod. 7402
Tramrail system incl. 2 ton hoist, rail & rectifier unit
Washing mch., Blakeslee-Niagara w 18" conv. complete
Tin plating barrel "Udylite" 30" dia.
Tin plating system complete w tanks, exhaust system, motor gen set & controls
Lapping mch., flat surface type "Ultra" #7 w mtr.

BOHN ALUMINUM & BRASS CORP.
1400 LAFAYETTE BLDG. DETROIT, MICH.

EQUIPMENT FOR SALE

3—30" x 72" and x 96" long
3—48" x 72" and x 84" long
Whiting tumbling barrels—belt driven. Complete in every respect.

FAIRBANKS, MORSE & CO.
ST. JOHNSBURY, VERMONT

FOR SALE

331 Osborn jolt rollover squeeze pattern draw molding machine. Two years old, in good condition. Can be seen in operation. Priced right for immediate sale.

BOX 548
THE FOUNDRY CLEVELAND 13, OHIO

FOR SALE

12—OSBORN ROLLOVER JOLT MOULDING MACHINES.

Stationary, model 2047-1. Flask space 22½" x 21½" draw 11½".

These machines are like new and are priced for a quick sale at $175.00 each. Original cost $2400.00 each, weight 3500 lbs. each.

CANTON INDUSTRIAL SALVAGE CO.
325 ELEVENTH ST. S.E. CANTON, OHIO

Classified Advertising

For Sale

FOR SALE

ONE AJAX INDUCTION HEAT FURNACE for melting or holding—100 KW, 240 Volts, 960 cycles, tilting device and hydraulic pump, micromax controller and Ray-o-tube, cubicle with switch gear 250-115V, 500 VA transformer (NEW).

FIVE (NEW) SHAW BOX 4000 POUND ELECTRIC HOISTS WITH MOTOR OPERATED CLEVELAND TRAMRAIL TROLLEYS AND SIX ELECTRIFIED SWITCHES MOTORIZED, FOR 10" CLEVELAND ARCH BEAM —(hot metal carriers) heat insulated motors, dual controls for floor or platform operating, variable speeds on trolleys and hoists, lift 17 feet at 28 ft. per minute, maximum traveling speed 180 ft. per minute 220/440/3/60.

TWO DETROIT ELECTRIC ROCKING TYPE CC melting furnaces, capacity 3000 pounds, 4000 V 7000 AMP transformers, extra shell and spare parts for furnaces.

KELSEY-HAYES WHEEL COMPANY
3600 MILITARY AVENUE
DETROIT 32, MICHIGAN
A. FRAZHO

FOR SALE

Complete equipment for the manufacture of foundry production plastic patterns and matchplates. Sales leads furnished. Price $2500.

PLASTIC MATCH PLATE CO.
3730 W. 116th ST. CLEVELAND 11, OHIO
PHONE—WINTON 2092

FOR SALE

Foundry Equipment of all kinds and all makes too numerous to mention. Please write for particulars.

HAYNES FOUNDRY EQUIPMENT
814 ADA ST. KALAMAZOO 52, MICH.

FOR SALE

One 36 x 42 Wheelabrator & loader @ $1500.00
One unused tumblast loader @ $ 690.00
45 Hines pop off flasks

(Write for list)

BOX 553
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE

TURBO BLOWERS (3 Phase, 60 Cycle)

cfm	Pressure	Make	Motor H.P.	Volts	Speed
3500	40 oz.	Spencer	60	440	1800
2200	40 oz.	Spencer	40	220/440	3600
1360	16 oz.	Nth. Amer.	10	440	1800
1050	32 oz.	Spencer	15	550	3500
900	24	Spencer	15	220/440	1800
650	32	Spencer	10	220/440	3600
225	10	Spencer	1	220/440	3600
150	3 lbs.	Spencer	5	220/440	3600

PRESSURE BLOWERS (3 Phase, 60 Cycle)

2500	7 oz.	Sturtevant	15	220/440	1800
2400	14 oz.	Mahr	15	220/440	3480
1400	8 oz.	Robinson	5	220/440	3600
1150	20 oz.	Nth. Amer.	10	220/440	3600
950	16 oz.	Nth. Amer.	7½	220/440	3600
660	20 oz.	A & B	7½	440	3600
550	20 oz.	A & B	5	440	3600
450	6 lbs.	A & B	30	220/440	3450
340	20 oz.	A & B	3	440	3600
250	12 oz.	Gen. Elec.	2	220/440	3600
150	12 oz.	Nth. Amer.	1	220	3600
150		McKee	1	440	3600

MOTOR REPAIR & MFG. CO.
1552 HAMILTON AVENUE
CLEVELAND, OHIO
FOR SALE

For Sale

FOR SALE

Perbeck mold dryer
Rock type core buster
Ten air rammers
Two 10-gallon blow torches
Three mold sprayers
Assortment of gaggers, clamps, and rigging
Sterling steel flasks
Square flasks, cast iron
Round flasks, cast iron
Demmler Core Blower Machine
Tabor—Bump and Rollover Machine
Milwaukee—Snap Mold Machine
Wadsworth—Core Cutting Machine
Armstrong Blum—Rod Cutting Machine
American—Rod Straightener and Shear
Clearfield Sand Muller
Simpson Muller
Enterprise Oil Burning Oven
Master Hi-Speed Mixer
Truckman Gasoline Operated Lift Truck
Coleman Oven
Two Motor Driven Sand Screenerators
Racks—Eight large ones for baking cores
Foundry Rigging
One Sandblast Machine — American — Foundry Equipment
One Standard Elec. Snagging Grinder
Grinding wheels
Pneumatic Chipping Hammers
Core Breakers

BOX 518
The FOUNDRY CLEVELAND 13, OHIO

FOR SALE

SURPLUS FOUNDRY EQUIPMENT

Milwaukee jolt pin lifter 46" x 48".
Jolt table 46' lift pin center 48" capacity 3500 lbs.
Jolt pattern draw molding machine No. 2 Johnson & Jennings 30" x 36" table.
Tabor core machine rollover pedestal type air draw 8" boxes, 14" x 24 x 12.
Core blowing machine. Demmler No. 5 pneumatic 10" v 43" sand magazine capacity 750 lbs.
Pangborn 8' rotary turntable, continuous abrasive feed, reclaimer and separation system.
Pangborn 6' rotary turntable suction feed with continuous feed.

CONSOLIDATED ELECTRIC & AIR PUMP CO.
141 MANGIN ST.
NEW YORK 2, N. Y.

FOR SALE

Tabor abrasive cutoff 10 H.P. motor, 16" wheel, 25" x 36" split table top. A-1 condition. Address: MANSFIELD SANITARY POTTERY, INC., PERRYSVILLE, OHIO.

For Sale

FOR IMMEDIATE SALE

VIBRATING SCREEN — Tyler - Niagara Type #300. Serial #8733". Size—72" x 48". V-belted motor drive. Complete with gear reducers, sheaves, and Jeffrey Belt Conveyor Bucket Type Elevator.

SAND MIXER OR MULLER—Clearfield #610. Serial #225-C. NEW IN 1944. 72" dia. pan. Capacity for charge—10-14 cu. ft. Motor driven w/15 h.p. 220/440 volts motor. Complete with motor driven hoist.

JOLT SQUEEZE PATTERN DRAW MOLDING MACHINES—Johnson & Jennings. NEW IN 1943. Table size—15" x 21". Head Platen size—12" x 8".

HAND ROLLOVER POWER DRAW MOLDING MACHINE—SPO. Complete with run out car. Size inside frame—22½" x 72".

#6T Ransome Tailstock, 16,000# capacity. Faceplate size 53" x 53". Distance floor to spindle center—49". Two available—like new.

VENTILATING FANS, 36" floor and wall models, 220 volts.

FALK MILL SUPPLY CO., INC.
18 WARD ST.
ROCHESTER 5, N. Y.

FOR SALE

1 ton Ingersoll-Rand air hoist, used 6 months—price $300.00.
100 Zephyr cooling fan, 4-24" dia. blades, 7 ft. chrome pedestal, base 24"—price $65.00—brand new.

W. N. RUSSELL & CO.
34 ALBERTSON AVE.
WESTMONT, NEW JERSEY

FOR SALE

Having sold our foundry desire to sell production patterns on two patented cast iron products needed in plumbing, heating and agricultural fields. Ideal for the foundry needing year round production. This ad is indeed worth investigating. Address: Box 576, The FOUNDRY, Cleveland 13, Ohio.

FOR SALE

(1) Sklenar 500 lb. capacity furnace complete with hood and stack. Will also trade for late model house trailer of equal value or car. Furnace is oil fired.
(1) 5 H. P. air compressor
(1) Coke fired core oven
(1) Large tumbler
(1) Double end buffing arbor (grinder)
(1) Welterweight air rammer
(1) Air squeezer and jolt squeezer
Air and electric vibrators, flask, jackets, boards —very good condition.

BOX 572
THE FOUNDRY CLEVELAND 13, OHIO

CLASSIFIED ADVERTISING RATES

POSITION WANTED—Minimum advertisement set solid, 30 words, $2.00. Additional words 7c each.

ALL OTHERS—"Help Wanted"—"For Sale"—"Wanted"—"Personals"—"Services", etc., minimum advertisement set solid, 30 words or less, $4.00. Additional words 12c each.

NOTE—If replies are to be sent to a box number in care of THE FOUNDRY, add 6 words to your advertisement for box number and address.

Any advertisement set in all capital letters, add 50% to the above rates.

* * *

Classified advertising forms close 13th of month preceding issue.

A NEW PRODUCT

Axial flow *Thru* Epicycloidal Rotors ~ *Compact ... Simple ... Positive ... Economical*

YEARS of research, refinement and service have preceded the introduction of our latest product—the STANDARDAIRE BLOWER. It features the axial flow principle in a positive displacement unit of sturdy, compact design. This all-purpose blower gives the greatest air or gas output per pound of weight that has ever been achieved in a positive displacement type blower. The blower is highly responsive to load demands—it's overall efficiency is also high, and for a given output the power consumption is low. Another factor of importance—the Standardaire Blower will deliver absolutely clean air because of its unique oil sealing arrangement. Consult with our engineers for specific details. ***Write The Standard Stoker Company, Inc., Dept. A-13 370 Lexington Avenue, New York 17, New York.***

Important Features of
Standardaire Blower

1. Handles gas or air under pressure or vacuum.

2. Capacities 20 to 15,000 cfm with discharge pressures to 20 pounds.

3. Compression is gradual giving a smooth discharge.

4. Unusually low decibel rating.

5. Permits direct drive by standard motors.

6. Tested in accordance with A. S. M. E. Standards.

For other important features write for Publication No. 84.

THE STANDARD STOKER CO • INC •

A PRODUCT OF **Standard Stoker**

NEW YORK • CHICAGO • ERIE • MONTREAL

ADVERTISING INDEX

A

Acheson Colloids Corp. 35
Acme Foundry Co. 252
Adams Co., The 54
Ajax Electric Co., Inc. 171, 226, 227
Ajax Electric Furnace Corp. 171, 226, 227
Ajax Electrothermic Corp. 171, 226, 227
Ajax Engineering Corp. 171, 226, 227
Ajax Flexible Coupling Co. 56
Ajax Metal Co. 171, 226, 227
Allis-Chalmers Mfg. Co. 20, 43
Alloy Metal Abrasive Co. 243
Alter Co. 249
American Air Filter Co., Inc. 17
American Bridge Co. 250
American British Chemical Supplies, Inc. 256
American Colloid Co. 181
American Gum Products Co. 257
American MonoRail Co., The 197
American Optical Co. 58
American Silica Sand Co. 173
American Steel Abrasives Co., The 247
American Wheelabrator & Equipment Corp. 108, 109, 187
Angell Nail & Chaplet Co., The 246
Arcade Mfg. Div., Rockwell Mfg. Co. 66

B

Bakelite Corp. 49
Baroid Sales Div., National Lead Co. 183
Bartlett, C. O., & Snow Co. 143
Bay State Abrasive Products Co. 111
Beardsley & Piper, Div. of Pettibone Mulliken Corp. 162, 163, 164, 165
Black, Sivalls & Bryson, Inc. 61
Blystone Div., Standard Sand & Machine Co. 254
British Moulding Machine Co., Ltd. 33
Buffalo Pattern Works 155

C

Campbell, Frank D. 149
Campbell-Hausfeld Co., The 160
Carborundum Co., The 32
Central Pattern Co. 254
Centrifugal Casting Machine Co. 255
Champion Foundry & Machine Co. 8, 9
Chicago Mfg. & Distributing Co. 15
City Pattern Foundry & Machine Co. 217
Clearfield Machine Co. 195
Clark Equipment Co., Industrial Truck Div. 232, 233
Cleco Div., of the Reed Roller Bit Co. 22
Cleveland Chaplet & Mfg. Co. 255
Cleveland Electro Metals Co., The 238
Cleveland Flux Co., The 207
Cleveland Metal Abrasive Co., The 198
Cleveland Tramrail Div., The Cleveland Crane & Engineering Co. 157
Climax Molybdenum Co. 240
Combined Supply & Equipment Co., Inc. 252
Construction Machinery Co.'s 257
Corn Products Refining Co. 153
Crobaugh, Frank L., Co., The 258

D

Davenport Machine & Foundry Co. 59
Dayton Oil Co., The 251
Dayton Pneumatic Tool Co. 250
DeBardeleben Coal Corp. 260
Delta Oil Products Co. 12
Demmler, Wm., & Bros. 213, 246
Detroit Electric Furnace Div., Kuhlman Electric Co. 205
Dietert, Harry W., Co. 259
Dravo Corp. 253, 258

E

Eastern Clay Products, Inc. 24
Eastman Kodak Co., X-Ray Div. 103
Electric Furnace Co., The 256
Electro Metallurgical Sales Corp. 41
Electro Refractories & Alloys Corp. 31
Erie Steel Construction Co. 241

F

Fabreeka Products Co., Inc. 30
Fanner Mfg. Co., The 47
Federal Foundry Supply Co., The 2
Federated Metals, Div. of American Smelting & Refining Co. 46
Fisher Furnaces Div., Lindberg Engineering Co. 37
Fordath Engineering Co., Ltd., The 244
Foundry Equipment Co., The 57
Foxboro Co., The 18
Fremont Flask Co., The 223
Fuller Co. 190

G

Gardner-Denver Co. 28
General Electric Co. 11, 55
General Foundry Service Corp. 236
Globe Iron Co. 221
Globe Steel Abrasive Co. 14
Great Lakes Foundry Sand Co. 19
Great Western Mfg. Co. 216

H

Harnischfeger Corp. 50
Hauck Mfg. Co. 258
Herman Pneumatic Machine Co. 185
Hickman, Williams & Co., Inc. 188, 256
Hines Flask Co., The 150, 151
Hough, Frank G., Co., The 45

I

Illinois Clay Products Co. 228
Imperial Belting Co. 237
Industrial Equipment Co. 245
Industrial Fabricating, Inc. 211
Industrial Pattern Works 141
Ingersoll-Rand Co. 21
International Graphite & Electrode Corp. 42
International Molding Machine Co. 128, 129
International Nickel Co., Inc., The 1, 243
Ironton Fire Brick Co., The 60

J

Jackson Iron & Steel Co., The 257
Jeffrey Mfg. Co., The 62
Johns-Manville 230
Johnson-March Corp., The 245
Johnston & Jennings Co., The 209
Joy Mfg. Co. 25

K

Keokuk Electro-Metals Co. 133
Kirk & Blum Mfg. Co., The 106
Krause, Chas. A., Milling Co. 117

Continued on Page 282

ADVERTISING INDEX

L

Laboratory Equipment Corp. 259
Lanly Co., The 52
Lindberg Engineering Co. 37
Linde Air Products Co., The 44
Link-Belt Co. Back Cover
Logan Co. 119

M

Marshall, L. H., Co. 224
Martin Engineering Co. 10
Master Pneumatic Tool Co., Inc., The 256
Mathieson Chemical Corp. Inside Front Cover
Metal Blast, Inc. 121
Miller-Taylor Tool Co. 248
Milwaukee Chaplet & Mfg. Co. 199
Milwaukee Foundry Equipment Co. 16
Modern Equipment Co. 284
Molybdenum Corp. of America 126
Moulders' Friend, The 26
Murphy, Jas. A., & Co. 244, 253

N

National Adhesives 218
National Engineering Co. 115
National Metal Abrasive Co. 256
National Pigment Co. 34
National Spectrographic Laboratories, Inc. 252
Neff & Fry Co., The 251
Newaygo Engineering Co. 231
Nicholls, Wm. H., Co., Inc. 36
Northern Engineering Works 200
Norton Co. 27
Norwalk Valve Co. 253

O

Ohio Electric Mfg. Co., The 101
Oliver Machinery Co. 246
Osborn Mfg. Co., The 138, 139

P

Pacific Graphite Co., Inc. 260
Pangborn Corp. 6, 7, 182
Parsons Engineering Corp. 260
Penn Iron Works 248
Pickands Mather & Co. 175
Pittsburgh Crushed Steel Co. 177
Pittsburgh Metals Purifying Co. 136
Plaster Process Castings Co. 201
Producers Core Sand Corp. 260
Propellair Div., of Robbins & Myers, Inc. 125
Puro-Seal Co., The 255
Putnam, A. H., Co. 258

R

Radium Chemical Co. 247
Redford Iron & Equipment Co. 167
Rietz Lumber Co. 239
Robeson Process Co. 257
Robinson Clay Product Co., The 169
Roller Riddle Corp. 29
Roots-Connersville Blower Corp. 189
Rotor Tool Co., The 53
Royer Foundry & Machine Co. 99

S

Sather Mfg. Co., Inc. 251
Schmieg Industries Inc. 191
Schneible, Claude B., Co. 51
Schramm, Inc. 204
Scientific Cast Products Corp., The 239
Semet-Solvay Div., Allied Chemical & Dye Corp. 235
Shanafelt Mfg. Co., The 159
Simonds Abrasive Co. 40
Simplicity Engineering Co. 135
Sly, W. W., Mfg. Co., The 113
Smillie, C. M., & Co. 259
Smith Oil & Refining Co. 48
Smith, Werner G., Co., The Front Cover, 4, 5
Smooth-On Mfg. Co. 250
Soeco, Inc. 254
SPO, Inc. 210
Standard Conveyor Co. 161
Standard Electrical Tool Co., The 254
Standard Silica Corp. 258
Standard Stoker Co., Inc., The 280
Stearns Magnetic Mfg. Co. 222
Steel Shot & Grit Co. 177
Sterling Wheelbarrow Co. 13, 237
Stevens, Frederic B., Inc. Inside Back Cover
Stow Mfg. Co. 249
Stroman Furnace & Engineering Co. 23
Swartwout Co., The 244
Syntron Co. 234

T

Tabor Mfg. Co., The 63
Tamms Silica Co. 241
Tennessee Products & Chemical Corp. 193
Toledo Matchplate Co. 201
Truscon Steel Co. 203

U

Union Carbide & Carbon Corp. 41, 44, 49
United Compound Co. 249
United States Electrical Tool Co., The 38
United States Graphite Co., The 64, 65
United States Rubber Co. 105
United States Steel Corp. 250
United States Steel Corp., Subsidiaries 250
United States Steel Export Co. 250
Universal Engineering Co. 179

V

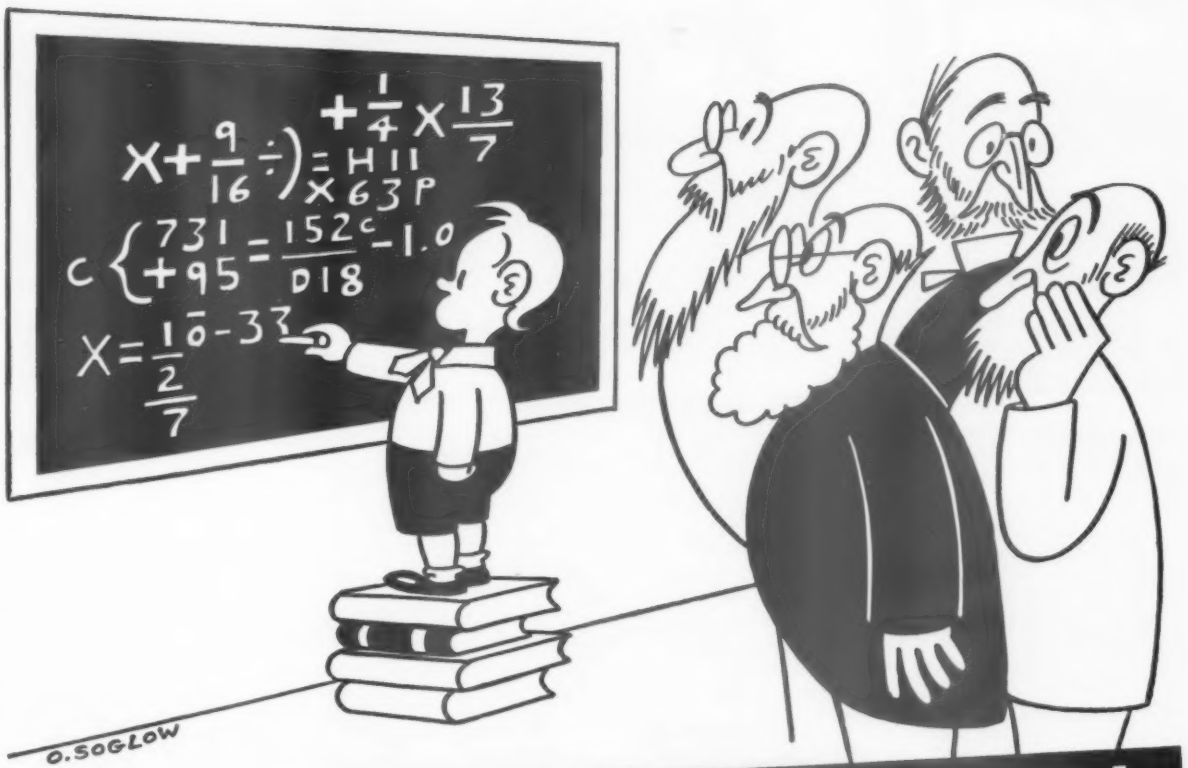
Van Products Co. 258
Vanadium Corp. of America 123

W

Webb, Jervis B., Co. 212
Wellman Bronze & Aluminum Co., The 248
Wellman Engineering Co., The 256
Western Metal Abrasives Co. 256
Westover Engineers 235
Wheland Co., The 131
Whiting Corp. 39
Willson Products, Inc. 176
Woodward Iron Co. 229

Table of Contents Page 3

Classified advertisers, 274, 275, 276, 277, 278, 279



You'll be surprised at these figures!

- 80 million Americans own $48 billion of U. S. Savings Bonds.
- 20,000 of the nation's 38,000 firms employing 100 or more persons are operating Payroll Savings Plans.
- 7,500,000 workers are buying an individual average of $20 of Bonds per month.
- For the year 1948, sales of Series E Bonds *exceeded redemptions* by $495,148,000. The net figure for all Series after redemptions and maturities was $2,151,140,000.

What does all this mean to you? Well, it means first of all that your Treasury Department is successful in its program of increasing the nation's economic security by spreading the national debt. Secondly it means that most of the nation's business leaders recognize the value of the Payroll Savings Plan sufficiently to promote it within their companies.

For example...

To give you some idea of the Plan's growing popularity: 86,384 employees of a prominent electrical manufacturing company were investing in Bonds at the rate of $30,005,270 as of the end of 1948. This is a gain of nearly 100% over 1947, when 45,000 employees participated in that company. The treasurer of a well-known shoe company reported that, of his concern's 19,060 employees, 9,240 were in the Plan and had invested $146,807.32 in Bonds via deductions during the preceding month.

Why promote it?

We all know how buying Bonds builds an individual's future security. But there are *company* benefits too! Nation-wide experience shows that Payroll Savings increases each participating employee's peace of mind—makes him a more contented, more productive worker. It reduces absenteeism, lowers accident rates, increases output, and improves employee-employer relations.

It's easy to boost participation

1. See that a top management man sponsors the Plan.

2. Secure the help of the employee organizations in promoting it.

3. Adequately use posters and leaflets and run stories and editorials in company publications to inform employees of the Plan's benefits to them.

4. Make a person-to-person canvass, once a year, to sign up participants.

These first four steps should win you 40-60% participation. Normal employee turnover necessitates one more step:

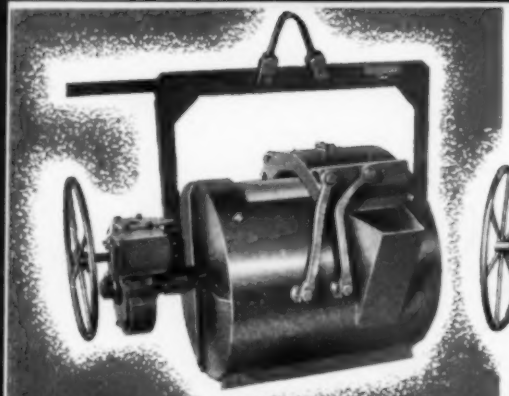
5. Urge each new employee, at the time he is hired, to sign up.

Nation-wide experience indicates that 50% of your employees can be persuaded to join—without high-pressure selling. All the help you need is available from your State Director, U. S. Treasury Department, Savings Bond Division.

The Treasury Department acknowledges with appreciation the publication of this message by

THE FOUNDRY

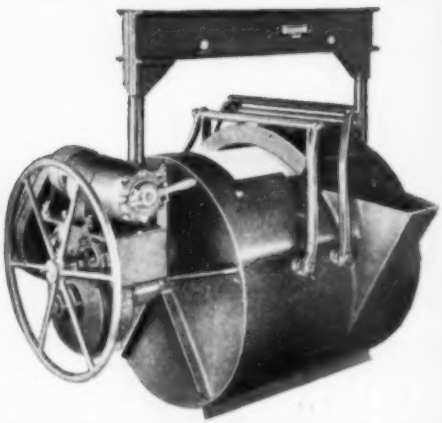
This is an official U. S. Treasury advertisement prepared under the auspices of the Treasury Department and The Advertising Council.



MODERN 800 lb. Geared, Covered and Insulated Cylindrical Ladle with square bail and crane-hook eye.

MODERN Special, 1500 lb. Covered and Insulated Geared Ladle with 5 Spouts.

MODERN 800 lb. Geared, Covered and Insulated Ladle with Square Bail and Crane Hook Eye. Cover in open position.



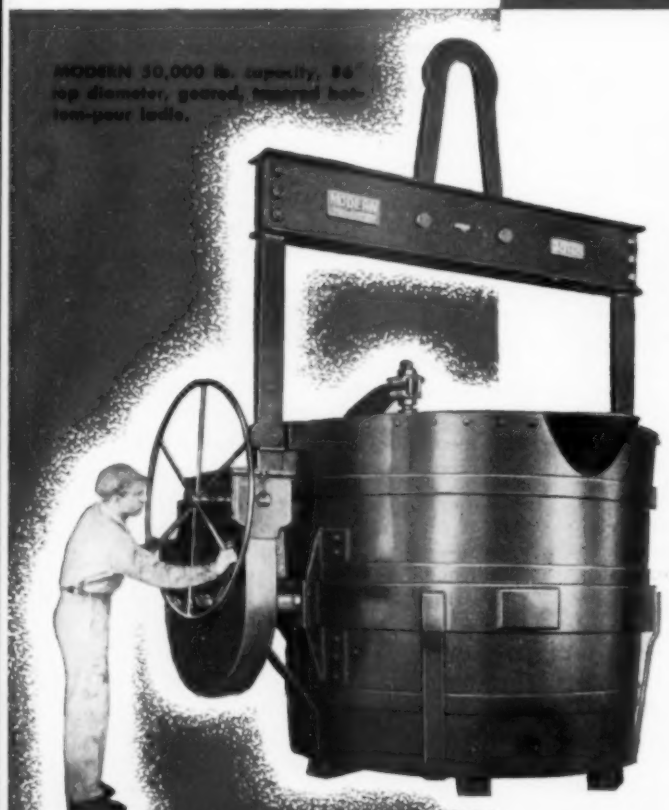
MODERN 2000 lb. Cylindrical Covered Ladle with special bail. Tilted by motor or hand wheel.

The *LATEST* in LADLES

By MODERN EQUIPMENT CO.

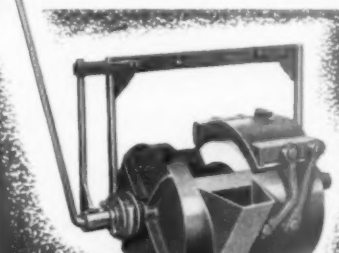
- in any Style or Capacity required.
- in step with the Foundry Industry's latest advancements in production methods and volume.
- pioneers in the design and construction of Foundry Ladles for every purpose.

MODERN 1200 lb. Geared, Single Shell, Covered and Insulated Ladle with V-Bail.

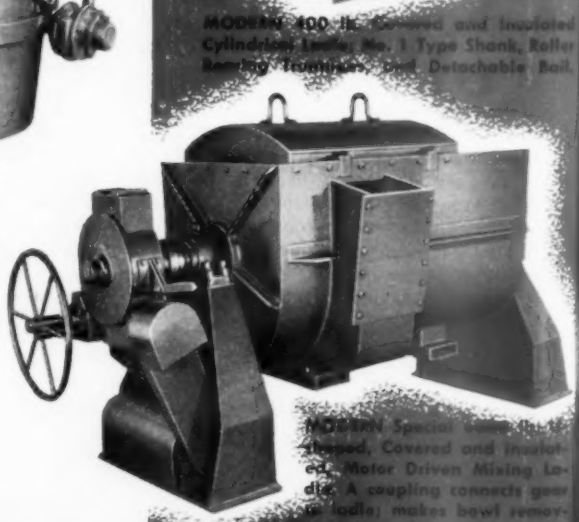


MODERN 30,000 lb. capacity, 86" top diameter, geared, tapered bottom-pour ladle.

MODERN 17½" Top-Diameter Tapered Covered Ladle with No. 1 Type Shank, Roller Bearing Trunnions and Detachable Bail.



MODERN 400 lb. Covered and Insulated Cylindrical Ladle, No. 1 Type Shank, Roller Bearing Trunnions and Detachable Bail.



MODERN Special 1000 lb. Tapered, Covered and Insulated Motor Driven Mixing Ladle. A coupling connects gear to ladle; makes bowl removable for re-lining.

Write for Bulletins 142 and 143.

MODERN EQUIPMENT CO.

PORT WASHINGTON, WISCONSIN

CUPOLAS • CUPOLA CHARGERS • LADLES OF ALL TYPES • POURING DEVICES • METAL POURING SYSTEMS • CRANE AND MONORAIL SYSTEMS • ELECTRIC CRANES.

10 Reasons why you should try Stevens TRI-COTE if you do high temperature pouring

1. **TRI-COTE IS ALL-PURPOSE, ALL-INCLUSIVE.** Eliminates need for any other coating. Can be BRUSHED, DIPPED OR SPRAYED on any type or size core or mold. Works equally as well for casting STEEL, GREY IRON, MALLEABLE IRON, BRASS OR BRONZE.
2. **TRI-COTE INSURES BETTER CORE, MOLD SURFACE.** Fills spaces between sand grains smoothly, completely.
3. **TRI-COTE STAYS IN SUSPENSION.** Little or no agitation is required. Solution standing for days needs only a few flips of a paddle to make it ready for use.
4. **TRI-COTE PREVENTS METAL PENETRATION** with perfect sand surface seal.
5. **TRI-COTE PENETRATES DEEP INTO SAND.** Gives more than sufficient depth of protection against hot metal action.
6. **TRI-COTE DOES NOT BUILD UP.** Levels out smooth on all surfaces. Covers edges thoroughly; does not crack in sharp corners.
7. **TRI-COTE IS READY FOR USE IMMEDIATELY** after mixing. Since Baume does not change, solution doesn't have to "set".
8. **TRI-COTE PEELS EASILY AND CLEANLY** from all metal surfaces.
9. **TRI-COTE DOES NOT RUN, SAG OR TEAR DROP,** form pimples or alligator skin.
10. **TRI-COTE HAS DIMENSIONAL STABILITY.** Does not creep, crack, spall or flake off cores or mold during or after metal pouring.

Imagine, if you can, an all-purpose core and mold coating that never fails to produce the same high quality casting finish through a range of temperatures varying from low to as high as 3200°F. Consider the fact that TRI-COTE (developed and perfected on the basis of ceramic principles) works equally as well on *all* metals.

Consider the advantages of being able to standardize on *one* coating to answer *all* core and mold coating requirements. It means you buy one product from one source and your core and mold coating worries are over for *every* operation in your foundry. Then do the wise thing.

Order a barrel of TRI-COTE today with the understanding that if you are not satisfied with the results it produces for you on your work, in your foundry, you may return any unused portion for full credit or your money back. You will find *TRI-COTE pays its way from the first day* you use it.

TRI-COTE TREATED MOLD of automotive die to be cast of high temperature alloy steel. Final finishing demanded sharp detail be held to close tolerances.

SHAKE OUT SHOWS TRI-COTE DID THE JOB with no sand sintering or metal penetration. TRI-COTE peeled easily, cleanly from metal surfaces.

ONLY MINIMUM BLAST CLEANING is required to turn out castings like this with TRI-COTE core and mold coating.

SINCE 1882 — STEVENS INCORPORATED — EVERYTHING FOUNDRY — DETROIT 16 MICHIGAN

LEADING MANUFACTURERS AND DISTRIBUTORS OF FOUNDRY FACINGS, EQUIPMENT AND SUPPLIES

FREDERIC B. Stevens INCORPORATED

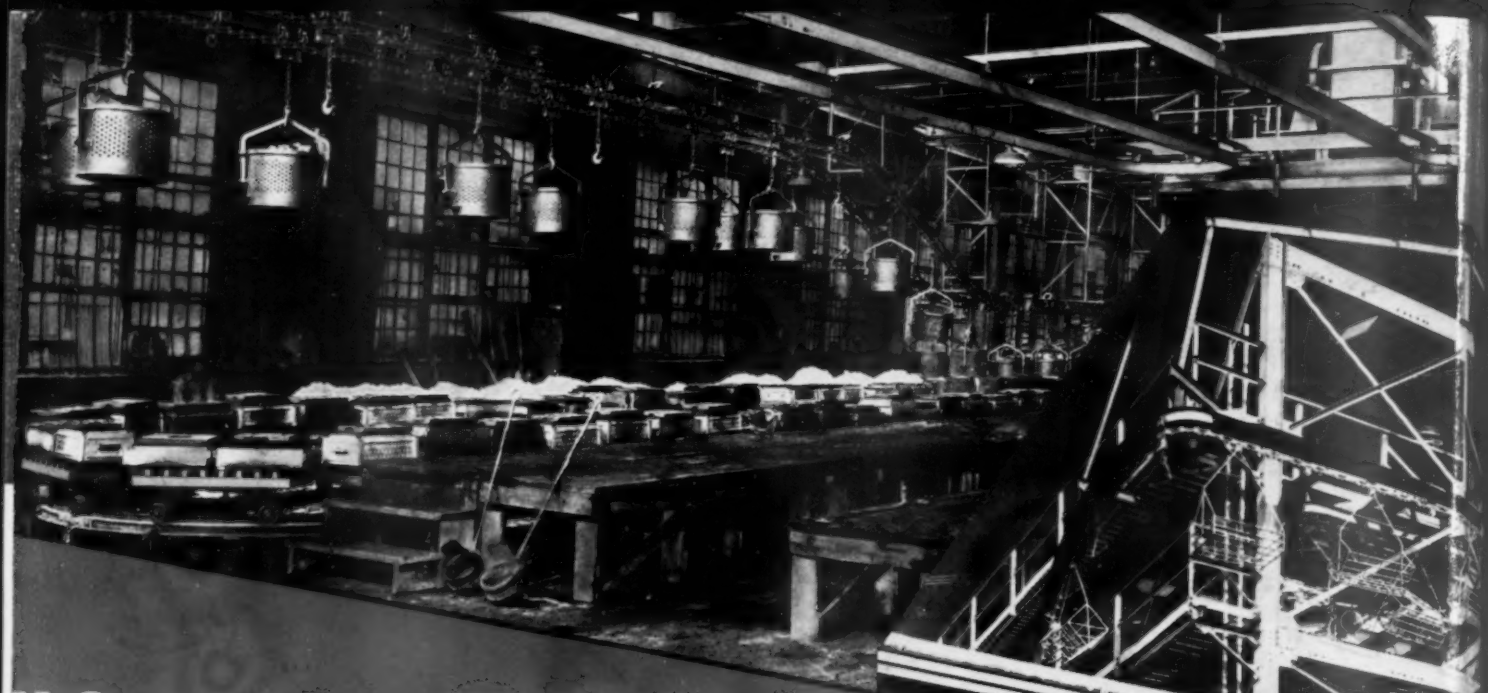
DETROIT 16, MICHIGAN

Branches • Sales Offices • BUFFALO • NEW HAVEN • INDIANAPOLIS • CLEVELAND

Representatives in Principal Cities

FREDERIC B. STEVENS OF CANADA, LTD. WINDSOR, TORONTO, ONTARIO

FOUNDRY EQUIPMENT AND SUPPLIES DIVISION



"Operation Unlimited"

LINK-BELT Overhead Conveyors for foundry mass production

Castings being handled through cooling cycles to cleaning rooms —sprue being dumped automatically at discharge station and finished cores being transported to foundry operations.

The possibilities of Link-Belt overhead conveyors in expediting mass production, cutting costs and making the foundry a better place for labor, are unlimited. Floor space is made available for production because trolley conveyors are supported from overhead and give double use of ceiling or roof trusses. They can travel irregular paths at predetermined speeds to meet production requirements. They are simple, rugged, inexpensive and easily installed around existing equipment. Path readily altered. Require little power to operate with practically no maintenance.

Let our experienced foundry engineers help you in applying trolley conveyor systems; also sand preparation and sand, mold, core and castings handling units to meet your requirements.

Top picture: Castings from shakeout stations handled in perforated buckets suspended from trolley conveyor. Above right: cooling tower with overhead conveyor handling individual castings. Below: pictures left to right show overhead trolley conveyors handling and automatically discharging sprue in charge make-up area, mold conveyor and core transport and storage conveyor, respectively.

LINK-BELT COMPANY

Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Dallas 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8. Offices in Principal Cities.

11,202

THE SYMBOL OF QUALITY LB LINK-BELT

LINK-BELT CONVEYORS

AND PREPARATION MACHINERY

MANUFACTURER'S ASSOCIATION, INC. FOUNDRY EQUIPMENT